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June
1934
Vol. XIX No. 6

Business and Technical Journal of the Welding Industry

TESTED AND APPROVED

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THE WELDING ENGINEER

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JUNE 1934

Vol. 19, No. 6

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· E D I T O R I A L ·

When the Job Couldn't Be Done, Another One Did It

• To say that something can't be done—even the impossible—might turn out to be a rash statement. It's far better to believe that it can be done, and then set out to find how to do it. A customer recently brought a hay-mower wheel into a welding shop in an Indiana town and had it repaired. Later he returned with the wheel, which had broken in the weld, and had it repaired a second time. Still it did not hold, and the shop did a third repair on it. When that failed, the welder remarked that it was no use to try again, and he advised his customer to buy a new wheel. Instead of taking the welder's advice, the farmer took the wheel to another shop, where the welder inspected it, noted that it had been welded, but said he could repair it. He inserted a jack between the spokes and spread the break apart, then welded the wheel, removed the jack and allowed the weld to cool. The weld has stood up in service, and the shop which did the successful job acquired a new customer. When the first shop told the farmer that it was no use to try welding his mower wheel, they might as well have wrapped him in cellophane and delivered him to their competitor. However, they must be given credit for at least trying to lick the job, although the solution lay beyond their experience and knowledge. There are a great many things that cannot possibly be done—until one has to do them, and then finds out how really simple they are. But it requires mental alertness, with which few are blessed.

Skeptics Are Not So Plentiful As at One Time

• Some concerns that heretofore have looked upon welded construction with skepticism, have now "taken the process to their bosoms." Skeptics are often made by some bitter experience which has caused them to take on an unwarranted attitude of complete disgust. But with the improved methods and materials in welding that are available today, unfortunate experiences with welding are far less likely to occur, and are virtually unknown if ordinary precautions are taken and common sense is used. One of these companies recently used welding on a job involving a combination of repair and fabrication. They were so delighted with the results, that when they recently designed a special type of valve for large headers they laid it out on the drawing board so that at least 90% of it is welded rolled steel, instead of castings as originally intended. Now they are giving considerable study to the welding processes and welded design in an effort to facilitate construction and gain economies. The possibilities of the welding processes are seldom fully realized until one gets intimately acquainted with them.

Cutting Costs by Scrapping Good Machines

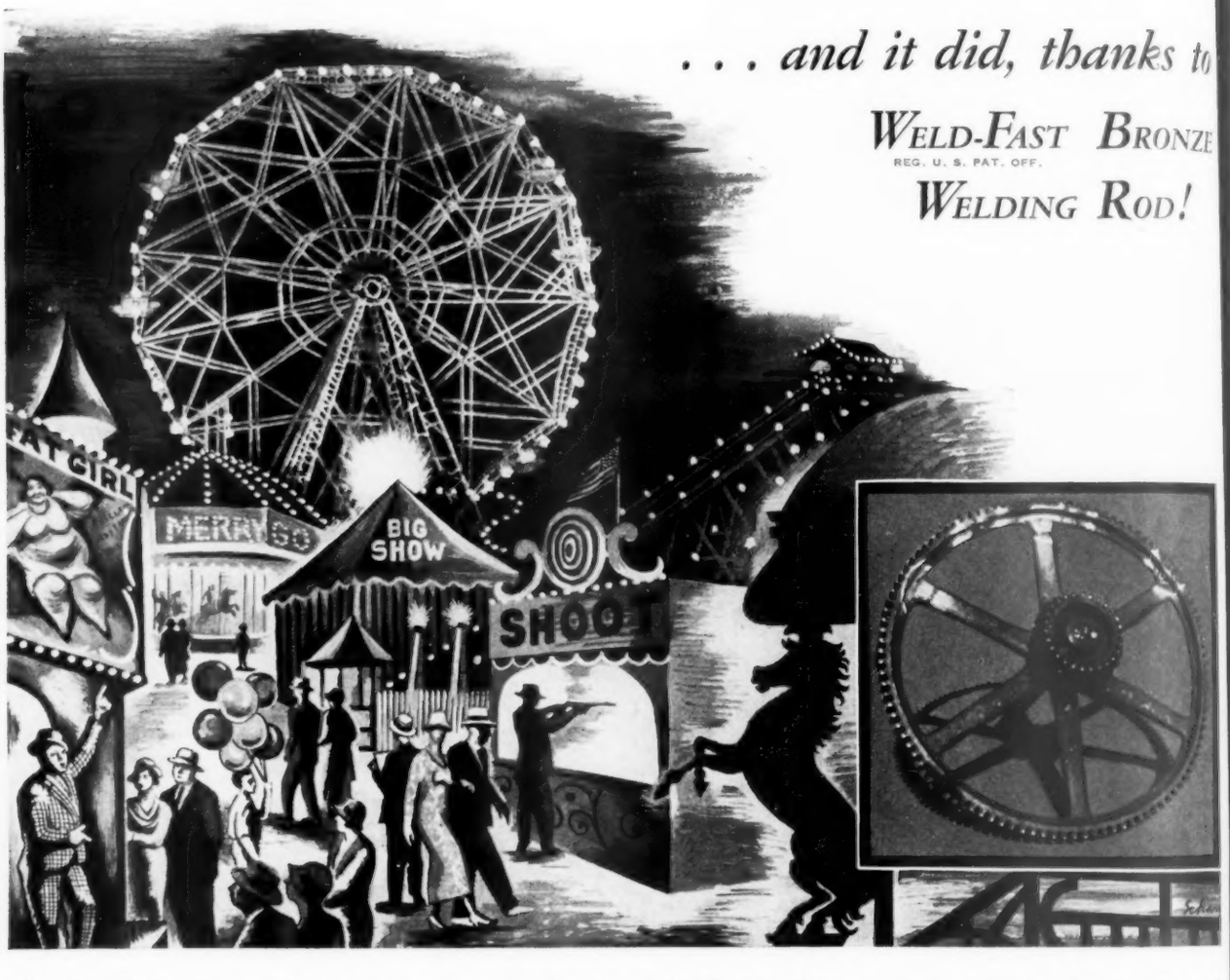
• To scrap some good 300-ampere, 25-volt arc welders and replace them with 40-volt machines designed to give 300 and 400 amperes, may not be as reckless a move as would appear at first blush. One concern doing a large amount of welding on steel plates and structural shapes, is doing that very thing, in order to reduce production costs. Here is the way it works out: With the 25-volt machines, an average of a little more than 9 ft. of welding per hour was possible on ¼-in. fillet welds, according to this company's experience. Exhaustive tests under similar conditions on ¼-in. fillet welds with a 40-volt machine, with a third of the welding vertical and two-thirds flat or down-hand, showed an average of more than 30 ft. of weld laid per hour, and inspection of the welds showed them to be of as good quality as heretofore. An inspection of real costs will ofttimes reveal unexpected results, as it did in this case.

The Mighty Welded Tube Was Once a Lowly Railroad Rail

• It is an interesting though little-known fact that the re-rolling of discarded railroad rails form the only business of some concerns. One such company in the Chicago steel district is producing welded tubing from second-hand rails, and recently installed a unit which welds about 60 ft. of this tubing a minute. At one time this company supplied only brazed tubing, but with the new unit in operation the electric-welded product is available. Being made from rails, the tubing has a high carbon content, so the development of the welding operation was not without its difficulties. When a business is built around the converting of discarded rails into new tubing without re-melting, one must conclude that there is still some romance in American industry.

"The Show must go on"

. . . and it did, thanks to WELD-FAST BRONZE REG. U. S. PAT. OFF. WELDING ROD!



A CARNIVAL without a Ferris wheel would be like a king without a kingdom! That's why the bosses of this carnival each morning, would test mechanical devices like the Ferris wheel to be sure they were in safe working order.

Imagine their dismay when, one morning, in a small Maryland Eastern Shore town they discovered broken spokes in one of the Ferris wheel's large driving wheels!

They called in a local welder. While realizing that quick repairs could be made, he was worried about having the job done right to eliminate any risk of life. So he phoned an expert in Baltimore, who upon hearing the story, flew down by airplane . . . bringing a supply of Revere Weld-Fast Bronze Welding Rod.

Upon arrival, the expert immediately went to work. Five welds were made . . . with no special preheating before welding. And . . . thanks to Weld-Fast . . . the show did go on that afternoon.

Check these Weld-Fast features against your present operations: (1) It makes welds stronger than mild steel. (2) It has a low melting point (1550° F.) which saves gas and speeds work. (3) It makes dense nonporous welds. (4) It machines unusually well. (5) It can be laid up in successive layers.

This story above is just one of many reported by welders. The proof of Weld-Fast Bronze Welding Rods' many advantages to you is in a trial. Why not write for further information . . . today.

Revere Copper *and* Brass

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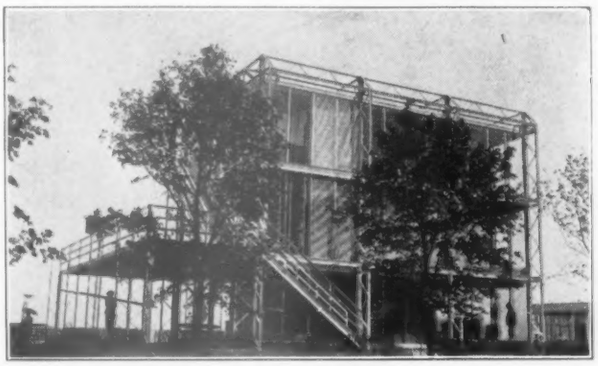
The Welding Engineer

VOLUME 19 JUNE, 1934 NUMBER 6

To the old saying that people who live in glass houses shouldn't throw stones, should be added the admonition that they build their house in a rigid framework of welded steel

A Welded Framework for the Crystal House



Exterior of Completed House

A STEEL house with an all-glass exterior, known as the Crystal House, has been erected at A Century of Progress, Chicago's World's Fair, and is located on Northerly Island, between the Social Science and the Electrical Buildings, in the East Court. This house, built by Modern Houses, Inc., 612 N. Michigan Ave., Chicago, Ill., was erected in sections fabricated by welding in the plant of the Mississippi Valley Structural Steel Co. Welding was employed not only for reasons of economy, but also to obtain a high degree of rigidity. Since glass will not withstand the hammering caused by the bending of a flexible structure in high winds, a very rigid framework was required.

The house has no bearing walls or partitions, but is supported by an exterior framework of lattice-type columns and trusses. These are designed with 4-in. 13.8-lb. channels as chords and 1-in. squares as diagonals, welded together into sections of standard lengths which are bolted together in the field. Welding was also used for fabricating the floors, roof, and stairs.

George Fred Keck, who designed the house, and who is also the designer of the House of Tomorrow, which has created a great deal of interest at the World's Fair, obtained a design whereby all the exterior steelwork is exposed as well as some of the interior, without the harshness that generally characterizes steel frames. The lines, in the main, are pleasing, and become more so as one becomes accustomed to them.

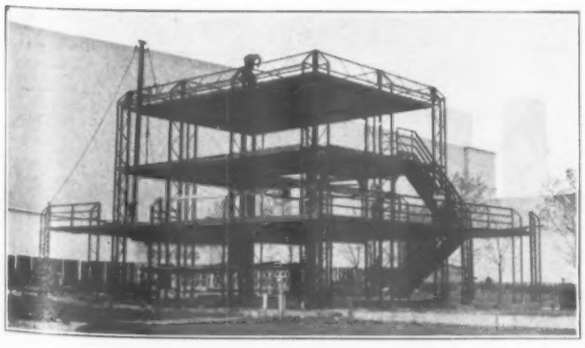
Mr. Keck has substituted glass for non-functional materials in building the walls, and cools and heats the house with an air-conditioning system. Only the sunlight comes in—all air is kept out, and the air in the house is recirculated and cleaned.

The house is three stories high, with no basement. The ground floor contains the garage, heating and cooling unit room, laundry facilities, a recreation room, and an entrance hall. The second or living floor contains a combination living and dining room, and a kitchen. The third floor contains two bedrooms and two baths.

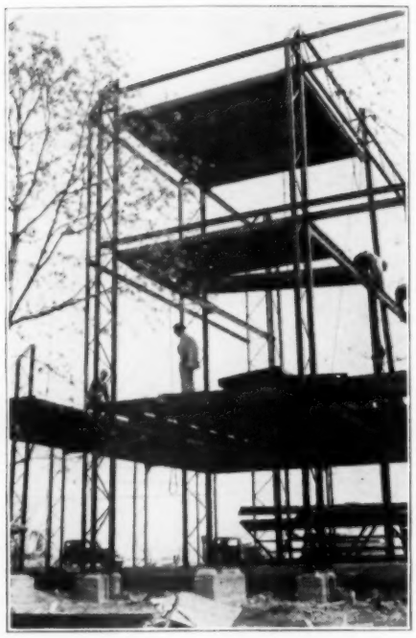
From the standpoint of cost, it is of interest that the house can be erected in three weeks after delivery of materials to the site. It is found that one week is required to put in the foundations, water, sewer and gas and to build a reinforced-concrete ground floor. The enclosure—the frame, glass and roof—will require one week; and during the third week the installation of the plumbing, air-conditioning unit, and all carpentry and electrical installations can be completed. Since at present the steel-frame and floor sections must be frabricated in the shop, additional time must be allowed for this work, if it requires more than a week. However, this design represents a serious attempt to reduce the time required for the erection of a residence.

All steel fabricating, in so far as was feasible, was done in the shop, where costs are greatly reduced over those in field erection. Then the shop-welded sections were transported to the site in trucks, and erected and bolted in place. This applies to the lattice-type framework, the floors and roof, and the stairs. To facilitate dismantling and salvaging of the steel frame sections intact, field bolting was resorted to instead of welding.

The floor and roof sections consist of $\frac{1}{8}$-in. plate with 5-in. channels welded to



The Framework and Floors Consist of Shop-Welded Sections. Field Joints Are Bolted to Facilitate Dismantling and Salvaging.



Putting Floor Sections in Place.

their sides. Stiffener bars, extending almost from channel to channel, are welded to the plate at intervals of about 3 ft. In the field, these sections are set in place and adjoining angles are bolted back-to-back, making each floor a single structural unit. The stairs, both interior and exterior, are similarly treated. The exterior stairs were built only to accommodate the handling of the crowds with the least confusion. All steelwork was painted before leaving the shop, and was delivered at the site in the colors desired. After the erection was completed, all scratch marks were touched up.

The house also has a porch, which was made up of welded sections bolted together at the site.

After the house was erected, it was found desirable to weld the field joints of the trusses over the roof. The trusses running the narrow way of the house are all of one piece, but those running the long way were in three sections, with the field joints bolted. This allowed too great a sway in the direction of the longitudinal axis; and to eliminate any possibility of shattering of the glass panels in the walls these joints later were welded to obtain a greater rigidity.

By the arrangement of the furniture, the use of great transparent curtains, preserving and softening the effect of the venetian blinds at the glass walls throughout the living rooms, and by the use of a color scheme light in tone, the interior gives an impression of spaciousness.

The Lattice-Type Columns Make a Rigid, Light Frame.

Oxyacetylene Charring of Wood for Ornamentation

The charring of wood for ornamental purposes is readily accomplished with the oxyacetylene torch. According to an instruction sheet issued by the Commercial Gas Co., Minneapolis, Minn., Western Pine Shiplap is an excellent wood for charring, since it is a soft wood, and therefore can be charred quickly and at small expense, and there is apt to be no loose knots and splinters. This company also says that Western Fir produces a beautiful finish, but the knots are apt to be looser than in pine. The flame should be decidedly oxidizing, and the cone of the flame should be held on the wood, it is said. The knots can be made to stand out in relief by playing the flame on them longer.

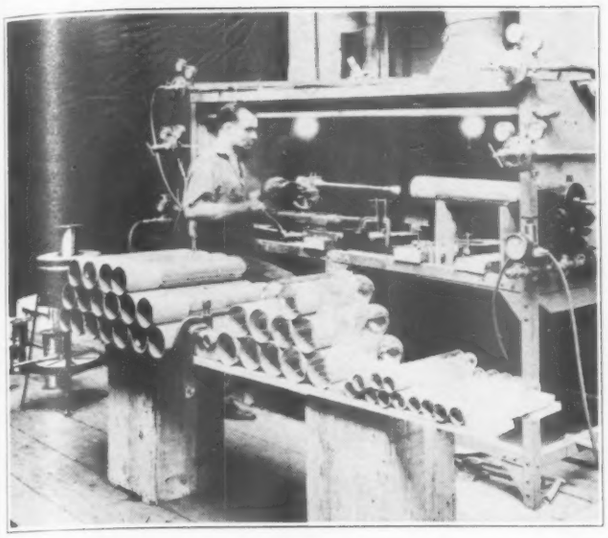
Wire brushing is recommended for finishing. The excess soot is first brushed off with a hand wire brush, then a motor-driven wire brush is used, this being of medium coarseness and at least 8 in. in diameter and traveling at a good speed. The board is drawn over the brush lengthwise with the grain, until the soft portion is practically white and clean, while the hard portion, or raised part of the grain, remains brown. The wood is then dusted with a soft cloth, after which several coats of brown floor wax are applied, or a white wax may be used to produce a beautiful grayish effect.

The Commercial Gas Co. has prepared a number of blueprints showing details of a corner cupboard, fireplace bellows, bench, antique chest, antique wood box, and bookcase, which can be made from wood treated with the oxyacetylene flame.

Corner Cabinet Made of Charred Wood.
(Photograph Courtesy Commercial Gas Co.)

A Louisiana lumber company is using the oxyacetylene charring method quite extensively, according to a recent issue of the *A. E. D. Bulletin*, issued by the Air Reduction Sales Co. This concern uses an Airco-DB machine welding torch with a 27-hole water-cooled welding tip, which has a capacity of treating between 3000 and 4500 lineal feet of Southern Pine, 12 in. wide and 1 in. thick, per hour. The action of the flame is so timed that the softer portions of the board surfaces become blackened and the harder spots are negligibly affected, as the accompanying view shows.

A Strip of Southern Pipe Burned With the Torch.
(Photograph Courtesy Air Reduction Sales Co.)



Using an Extension Rotary Nozzle, the Spray Gun Deposits a Copper Coating on the Inside and Outside Surfaces of These Glass Tubes, Converting Them Into Electrical Condensers.

The Metals-Coating Process . . .

resembles welding, insofar as it, too, is a consumer of gases and metals, and is a valuable production and maintenance tool, states Mr. Binder in this paper, read before the 34th Annual Convention, International Acetylene Association, in Chicago, Sept. 26-29, 1934.

■ By **RICHARD L. BINDER**
Metals Coating Co. of America

THE term, sprayed metal coatings, pertains to a process and equipment with which any stock metal, in the form of wire or of a granulated (dust) character, may be simultaneously melted, atomized and impacted to produce a coherent, attached or separable coating on the surface of any substance, whether that substance be metallic, vitreous, fibrous, inflammable, conducting, or insulating, regardless of size or location.

This description might entitle me to stop right here, in that the broad scope which the description covers really states what it actually does for nearly all industries; but much more may be said of sprayed metal coatings.

We are justified at this time, after years of personal effort, in assuming that this industry, which we have had a large part in developing, is an accepted fact, and that the metal-coating process does what we conservatively claim for it.

The perfection of apparatus for metal spraying was ingenious. It attracted the attention of the curious by its spectacular and radical methods of handling metals; but its real intrinsic merit arose solely from the development of practical and profitable outlets for its use.

Too little attention has been given by prospective users, to metal coating as an industry, to its importance as a consumer of gases and metals, to the profits and savings in maintenance expense, and to its capacity for production and mass output.

Having selected, as a key, the economies involved, and being aware that economies naturally suggest wealth, I feel privileged to refer to the extensive and expensive development and research which were necessary before the process, as we know it today, was made available to industry. Our investment was necessarily based on hopes; those made by our customers through purchase and use are based on actualities. From the crude first device to the present-day "Metalayer," our conservative claims as to practical results have undoubtedly inured to the good repute which metal coating, as a process, now enjoys.

Process Is Dependent on Auxiliary Arts for Its Success

The task of impressing on the uninformed metal-coating enthusiast that metal coating, an art in itself, is closely

Defects in Face of Paper-Drying Roll Are Readily Repaired.

linked to a number of previously developed accessory arts before benefits are available, is a thankless burden. The necessity of suitable surface conditions on which coatings are to be applied, fuel-gas control, desirable changes in usual machine-shop practices, recognition of limitations from a metallurgical or chemical standpoint, effects of electrolysis, etc., are usually overlooked by the uninitiated. Do not interpret this as a requirement that every one who intends to use sprayed metal coatings must first master *all* of the problems of *all* of these arts.

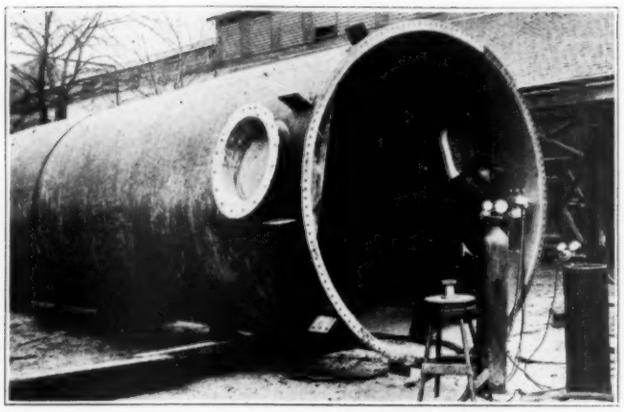
The selection of suitable control apparatus, provisions for exhausting gases of combustion, equipment for the preparation of the surfaces and for handling the materials used therefor, the economical production and use of the compressed-air supply, apparatus for handling the metal used, and the proper manufacture and selection of the wire itself for a given service requirement—all have to be intelligently considered before profit-producing results are obtained. The human element also enters into the production of sprayed metal coatings, and calls for careful study.

To dispose of the products of combustion while the "Metalayer" is in operation, and with the view of maintaining the efficiency of the operator throughout the full working day, we developed a spraying table with exhaust hood. This unit provides a well-designed work bench, and a headquarters where the outfit may be kept in readiness for instant use. At the top of the ventilated hood, along the front edge, a perforated tube establishes an invisible air curtain. This prevents waste metals and gases from blowing back on the operator when coatings are being applied to the interior surfaces of hollow vessels. The manifold may be dis-

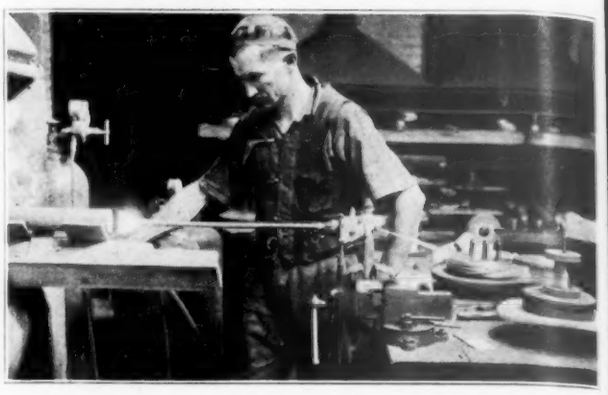
Reconditioning Door Stamping Dies.
(These dies, for stamping out automobile doors, are good for 150,000 stampings after having the low spots built up with sprayed molted nickel.)

connected for use in applying coatings on pieces which cannot be handled on the table. Electric lighting fixtures provide illumination.

In our practical metal-coating bench



Coating a 50-Ft. Gas Scrubber With Molten Lead.



Coating the Inside Walls of Tubing With Sprayed Molten Zinc, Using a Rotary Nozzle Attachment.

are incorporated the essential elements of a complete control equipment; namely, a "Metalayer" with standard nozzle and another with a rotary extension nozzle, oxygen and acetylene regulators, a hood with motor-driven exhaust fan, a pressure-reducing air valve, air strainer, water and oil separator, air curtain, turntable, and ball-bearing wire reel — all making a self-contained unit adapted for handling a large variety of work.

While the "Metalayer" will operate with a wide range of gas pressure, accurate proportioning of the oxygen and acetylene is essential for definite and reproducible results. Experience has shown that spraying of some metals, cadmium for instance, requires accurate adjustment of these proportions, and therefore the gas control must be sensitive enough to respond to such delicate control.

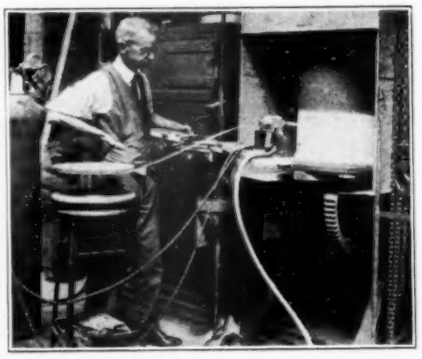
Uninterrupted operation requires an even feed of wire through the "Metalayer." Ordinary wire reels are too sluggish and erratic. We recommend a horizontal ball-bearing wire reel that is perfectly balanced and which, whether carrying a full or practically empty coil or spool, eliminates undesirable drag and wear on the gear train and turbine in the "Metalayer" and avoids over-running and consequent tangling of the wire.

Rough or Open-Grained Surfaces Can Be Coated

The importance of properly preparing surfaces for the application of sprayed metal coatings cannot be overemphasized. Blasting surfaces by the use of abrasives has been definitely established as the most economical and satisfactory method. This processing is usually referred to as "sand-blasting," although abrasives other than sand are used in its operation. Sand-blasting not only cleans surfaces, but develops the required roughened or open-grained structure to which the molten sprayed particles, applied with the "Metalayer," will firmly adhere. Sand-blasting is absolutely necessary when sprayed metal coatings are applied to close-grained metallic areas. While sprayed metal might adhere to a properly prepared surface, even if it is not perfectly clean, the permanency of such adherance would be affected in proportion to the amount of contamination which was present when the coatings were applied. Some materials such as brick and terra cotta possess a natural open-grained surface which, if clean, permits the application of coatings without the necessity of sand-blasting.

The syphon type sand-blast cabinet is suited for handling light-gage materials of reasonably small size, or delicate-faced materials on which care is required to avoid damage to contours or to the original face.

For use with the pressure-type sand-blast machine, we recommend a steel room in which are incorporated features for ventilation which meet the requirements of the various factory inspection and state health laws, and permit the



Spraying Aluminum on Engine Cylinder Liner.

(Coating the water side of this marine-Diesel-engine cylinder liner with aluminum, permitted the use of cast aluminum water jackets to reduce the weight of the engine.)

turning out of large quantities of work at low operating costs. This equipment makes a complete self-contained unit, on which are mounted a motor-driven exhaust fan, motor-driven abrasive elevator, water separator, the control equipment for starting and stopping operations, and the helmet for protecting the operator. To conserve the breaking up of abrasive, the interior is lined with an abrasive-resistant compound, which also functions to decrease greatly the damage which would otherwise take place to the walls.

A small, portable sand-blast machine has proved itself of definite value for small areas or emergency work which must be handled at location.

The compressed-air supply, used in conjunction with the oxyacetylene gas for operating the "Metalayer," demands consideration and has a definite effect on the final cost of applying sprayed metal coatings.

The "Metalayer" unit, while weighing only 3½ lb., actually absorbs from the combustion of the gas and from the compressed air approximately 25 hp. of energy, or over 7 hp. per pound of its weight, compared with ⅛ hp. per pound for a modern automobile engine. It can be considered, therefore, as a highly efficient piece of apparatus. The maximum operating gas pressure for the unit (15 lb. per sq. in.) conforms to Underwriters' Laboratories rulings. The cost of supplying this energy definitely affects the final cost of applying coatings.

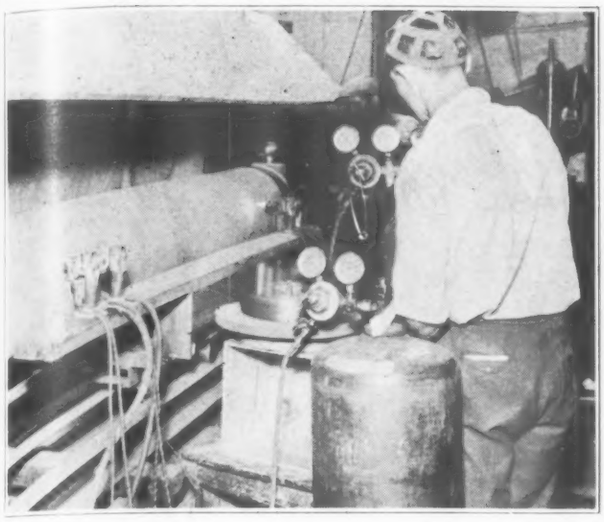
The list of practical commercial applications for which the "Metalayer" has been used is almost unlimited.

Defects in castings can be filled with sprayed metal. As examples, cracked automobile crankcases can be repaired; grate bars can be coated with metal and their usefulness extended over a considerably longer time; bearings of all sorts can be reclaimed by spraying the metal on the bearing surface and thus building it up to any desired dimension.

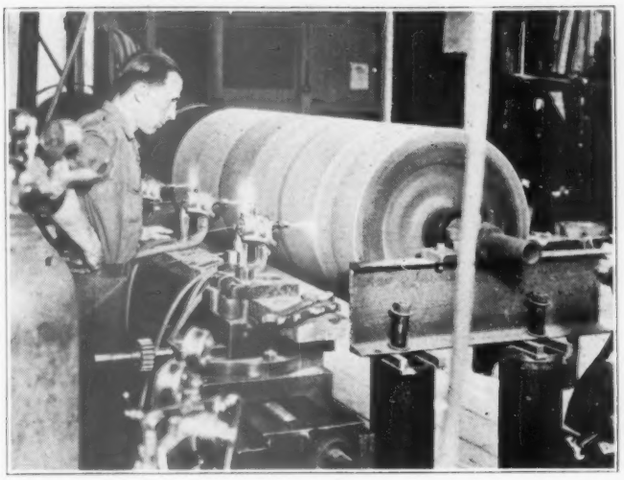
An extension rotary nozzle can be used with the "Metalayer" for coating the interior of tubes or pipes. This work is often performed on such pieces of equipment as feedwater separators and thermal syphons for locomotives.

Process Is Applicable to Large Structural Details

An example of the extent to which metal coating can be used is to be found in one extensive job. A huge canal gate



Correcting the Porosity of a 9000-Lb. Hydraulic Ram by Spraying the Surface With Molten Copper.



Coating a Cylinder Roll With Sprayed Stainless Iron.

(The use of three "Metalayers," above, and of four units, in the photograph at the left, greatly reduces the time required to complete these jobs.)

measuring about 30 ft. in length by 50 ft. in height was entirely coated with sprayed molten zinc applied with the "Metalayer." Other large structural pieces can be coated in a similar way—bridge girders, for instance. Printing-press rolls, calender rolls, and similar large castings often develop surface defects which make them practically worthless; with the "Metalayer" the pitting or defects can be built-up within a short time with great savings.

In building-up shafts and similar articles the "Metalayer" is mounted on a standard or tool post. The shaft can then be revolved in a lathe or similar machine so that the coating of metal can be governed to cover adequately and evenly the part to be built-up.

Materials of Many Types Can Be Given Decorative Surfaces

One of the further uses of metal coatings is in the development of decorative surfaces for all types of materials. You have, no doubt, seen much of this without knowing how these coatings were applied. This particular application has been used extensively on metallic articles, household equipment and ornaments, and file cabinets and other office furniture. Stencils are used in this type of decorative work. Similarly, metal coatings can be applied to terra cotta or brick, thus giving a metal surface to the building material or decoration and fur-

Detailed Costs of Typical Salvaging Jobs, Including Savings.

Description of Reclaimed Part		LABOR: Handling	LABOR: Sandblasting	LABOR: Metal Coating	LABOR: Finishing	MATERIAL: Air for Sandblasting	MATERIAL: Air for Metal Coating	MATERIAL: Oxygen and Acetylene	MATERIAL: Wire	Total Cost (Overhead incl.)	Cost of Replacing with New Part	Saving with Metalayer	Elapsed Shop Time
3 Power Valve Stems	Minutes	3	5	15	.....	5	15	15	6 oz.	$ 2.55	$13.23	81%	23 min.
	Rate/Hr.	$.56	$.56	$.76	.....	$.90	$.30	$.60	Iron				
	Cost	.026	.045	.19	.....	.073	.074	.14	$.11				
Adjusting Screw Shaft Sleeve	Minutes	15	20	60	.....	20	60	60	14 oz.	3.49	14.00	75%	1 hr. 35 min.
	Rate/Hr.	$.56	$.56	$.76	.....	$.90	$.30	$.56	Piano Wire				
	Cost	.14	.187	.76	.....	.30	.30	.56	$.43				
2 Turbine Shafts for Pump	Minutes	20	10	30	.....	10	30	30	5 oz.	3.71	91.10	96%	1 hr.
	Rate/Hr.	$.56	$.56	$.76	.....	$.90	$.30	$.56	Piano Wire				
	Cost	.187	.094	.38	.....	.15	.15	.28	$.16				
Building Up Ring Grooves in Piston Head	Minutes	.....	20	105	.....	20	105	105	1 lb.	4.72	14.70	67%	2 hr. 5 min.
	Rate/Hr.	.....	$.54	$.76	.....	$.90	$.30	$.56	Iron Wire				
	Cost	.....	.18	1.38	.....	.30	.525	.98	$.28				
Drive Shaft of Duplex Stoker	Minutes	15	15	120	.....	15	120	120	2¼ lb.	5.81	19.80	70%	2 hr. 30 min.
	Rate/Hr.	$.54	$.54	$.76	.....	$.90	$.30	$.56	Piano Wire				
	Cost	.135	.135	1.52	.....	.225	.60	1.12	$.739				
Sliding Shaft of Mechanical Lubricator	Minutes	5	5	30	.....	5	30	30	3 oz.	2.24	6.14	64%	40 min.
	Rate/Hr.	$.54	$.54	$.76	.....	$.90	$.30	$.56	Piano Wire				
	Cost	.045	.045	.38	.....	.075	.15	.28	$.079				
Valve Chamber Bushing	Minutes	15	15	90	.....	15	90	90	Iron Wire	4.40	26.89	83%	2 hr.
	Rate/Hr.	$.54	$.54	$.76	.....	$.90	$.30	$.56	$.42				
	Cost	.14	.14	1.14	.....	.225	.45	.84					
Building Up Armature Shaft	Minutes	10	10	45	30	10	45	45	1 lb.	3.21	61.14	95%	1 hr. 35 min.
	Rate/Hr.	$.56	$.56	$.76	$.83	$.90	$.30	$.56	Piano Wire				
	Cost	.093	093	57	.415	.15	.23	.42	$.42				
Piston Rod Tube	Minutes	5	5	180	65	5	180	180	3½ lb.	10.75	21.00	49%	4 hr. 15 min.
	Rate/Hr.	$.56	$.56	$.76	$.83	$.90	$.30	$.56	Monel Wire				
	Cost	.045	.045	2.28	.91	.075	.90	1.68	$2.35				
10 Driving Box Crown Brasses	Minutes	.....	5	60	19	5	60	60	2 lb.	36.20	179.03	80%	1 hr. 24 min.
	Rate/Hr.	.....	$.56	$.76	$.83	$.90	$.30	$.56	Bronze Wire				
	Cost	.....	.045	.76	.26	.075	.30	.56	$.85				
2 Steel Main Rod Bushings	Minutes	120	60	120	85	60	120	120	1¾ lb.	10.33	44.92	77%	6 hr. 25 min.
	Rate/Hr.	$.54	$.54	$.76	$.83	$.90	$.30	$.56	Iron Wire				
	Cost	1.08	.54	1.52	1 18	90	.60	1.12	$.49				
Chamber Pilot and Main Valve	Minutes	2	5	10	.....	5	10	10	3 oz.	0.68	24.60	97%	17 min.
	Rate/Hr.	$.56	$.56	$.76	.....	$.90	$.30	$.56	Monel Wire				
	Cost	.019	.046	.126	.....	.075	.05	.093	$.126				
Chamber Pilot and Main Valve	Minutes	5	5	10	.....	5	10	10	5 oz.	0.69	30.00	98%	20 min.
	Rate/Hr.	$.56	$.56	$.76	.....	$.90	$.30	$.56	Iron Wire				
	Cost	.046	.046	.126	.....	.075	.05	.093	$.007				
Portable Boring Bar 4 in. x 8 ft.	Hours	1	½	12	8	½	12	12	10 lb.	43.06	147.00	70%	21 hr. 30 min.
	Rate/Hr.	$.56	$.56	$.76	$.83	$.90	$.30	$.56	Piano Wire				
	Cost	.56	.28	9.12	6.64	.45	3.60	6.72	$4.23				

nishing a new architectural medium.

The mass coating machine is splendidly adapted for applying sprayed metal coatings to screws, bolts, nails and materials of a similar character. Approximately 100 lb. of such material is placed in the revolving container, and is coated at a low cost.

Installations of metal-spraying apparatus may be divided into two groups without drawing a definite line between them.

In the first group is included outfits to meet the requirements of individual manufacturing plants. This outlet has supplied us with our largest volume of business.

The second group takes in installations for the development of a job metal-coating business, either as a new line of endeavor or in combination with the jobbing machine-shop industry. Our customers who have developed this as a line of business have not only secured profits from the operation of the metal-coating process, but have increased the volume of machine work which the combination of these services has brought them.

We have accumulated an unlimited number of data pertaining to the economies developed by the use of sprayed metal coatings. Routine production jobs would establish a definite cost for reproduction. Individual coating jobs must each be considered as of themselves.

Welded Seams in Galvanized Cans Are Sprayed With Molten Zinc

A definite object lesson is available by the example of a type of artificial-ice-manufacturing can on which a metal coating has been applied. Our customer, who is the largest manufacturer of this type of equipment in the world, installed one of our units for replacing the zinc spelter which was burned off the galvanized sheet where welds were made. The necessity of replacing this zinc was apparent. The ability to apply sprayed metal coatings locally on the welded areas enabled him to market these cans with the assurance of obtaining the highest degree of durability. Approximately 4 oz. of zinc was applied on about 13 linear feet of weld. The original output aimed at by this operator was 8 cans per hour per unit. By providing mechanical control for the operation of the "Metalayer," 80 cans per hour are being turned out per unit.

We are frequently confronted in our sales work with statements that expensive equipment really becomes obsolete before it rusts out, but analysis has shown definitely that such is not the case. In many instances we have convinced users of such apparatus that the removal of the rust-caused contamination from their product was costing much more than the deterioration of the equipment itself. Needless to say, an increase of durability removes such items of replacement costs as disposing of the old and transportation and erection of the new.

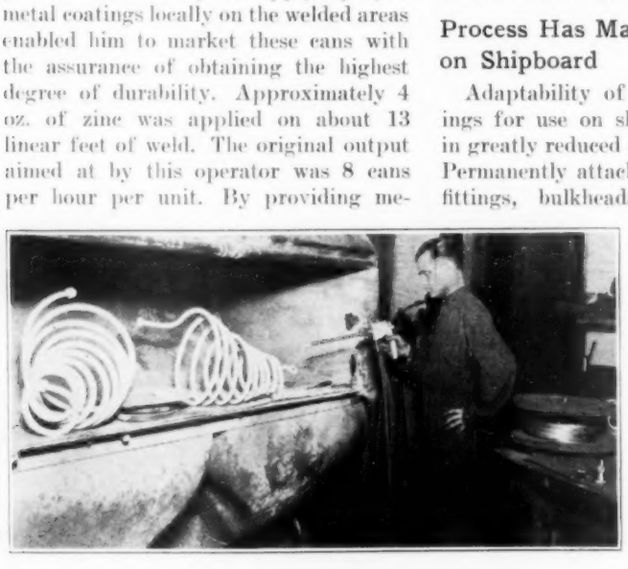
The conservation of the vast investment in equipment already installed by providing better methods of protecting it from corrosion opened another field. In this we were confronted by the admittedly higher first cost of applying sprayed metal coatings as compared with those methods already in use, but again

Coating Pipe Fittings With Sprayed Zinc.
(By using the mass coating machine, the cost per unit product is very much reduced. Rechasing the threads is unnecessary.)

the practically permanent results secured clearly indicated the commercial values of our method.

Process Has Many Uses on Shipboard

Adaptability of sprayed metal coatings for use on shipboard has resulted in greatly reduced costs for maintenance. Permanently attached and movable deck fittings, bulkheads, companion steps,



Spraying Molten Aluminum Onto Copper Pipe Coils.

Repairing a Surface Defect.
(This expensive 5-ton cast-iron printing-press cylinder was salvaged by spraying over defects with ingot iron, then machining to a perfect finish.)

water-storage tanks, oil and gasoline tanks either for fuel or for bulk freight, mechanical equipment such as piston rods, valve stems, bearings, etc., have been reconditioned and made as good as new at remarkably low costs. Furnace parts subjected to deterioration from exposure to high temperatures are made much more durable by metal coating with aluminum. Occasions have arisen where such work was carried on while vessels were under way.

Metal coating is an established industry. Approximately 6,000 installations have been sold for the spraying of metal by the oxyacetylene process. Five thousand of these are in operation, of which approximately 1,250 are in use in the United States. The consumption of gases of these 5,000 units may be reasonably estimated at over $5,000,000 worth per year, and the amount of metal used is a correspondingly impressive item. The market created for air compressors and accessory equipment has developed employment for labor in their production in addition to that of the actual metal-coating operators. A considerable market has been created for wire of special alloys. Cadmium wire is used only on metal-coating work and the tonnage required is continually increasing.

A "Metalayer" operating 5 hours per day during 300 working days in the year will handle approximately 7 tons of zinc wire or about 30 tons of lead wire. These 7 tons of zinc wire will cover approximately 60,000 sq. ft. of surface and, if it be applied to steel $\frac{3}{8}$ in. thick, which is the average section used in structural work, this zinc would increase the durability of 450 tons of steel per year.

Expensive Equipment Can Be Salvaged at Low Cost

Of greater importance is the proportion of value of machine parts which have been salvaged or saved from rejection. In numerous cases 1 lb. of sprayed high-carbon steel, applied at a cost of approximately $2, has salvaged

thousands of dollars worth of equipment.

The metal-spraying process also provides a market for the sale of oxygen, acetylene, hydrogen and other fuel gases. Oxyacetylene has the advantage of a superior heating value in comparison with any other gas available, and in combustion it clearly indicates to the operator whether he is using a reducing, neutral or oxidizing flame; but its chief advantage lies in its ability to develop higher temperatures and thus increase the rate of deposit of metal. Its reducing characteristic in combustion develops a higher percentage of carbon than other fuel gases, which definitely establishes it as the most satisfactory melting medium for use in the application of sprayed metal coatings. Its ready availability, the well-established organizations who manufacture and distribute it and the service they render their customers, and the fact that the welding and cutting torch tie in so well with the use of sprayed-metal-coating apparatus, indicate how closely the "Metalayer" and distribution of this fuel are combined.

The benefit of the metal-spraying process to acetylene manufacturers is evident when one considers that one unit, operating under NRA regulations, will consume in one year 30,000 cu. ft. each of oxygen and acetylene, representing between $1,000 and $1,500 worth of gas.

Prize Fighter Enrolls for Welding Course

Gene Stanton, well-known heavyweight prize fighter, has enrolled as a student in The Cleveland School of Welding, Inc., Cleveland, Ohio. In the past, this school has numbered among its students other prize fighters, but Stanton is the first enrollment from the weight division. He is 27 years old, and has been a devotee of the ring for 6 years. Now he wishes he had taken up welding five years ago, he says.

San Francisco Group Views Progress of Large Bridges

The meeting of the San Francisco Section of the American Welding Society held April 28th assumed a nautical aspect, as some 100 members and their guests set sail from San Francisco in one of the large Crowley launches on an inspection tour of the construction work now in progress on the San Francisco-Oakland Bay Bridge, and the Golden Gate Bridge. Three engineers, Howard Wood, Frank Lucas and Edward S. Thayer, accompanied the groups to explain to them the various construction methods and features of design of the bridges.

The first stop of the cruise was at Pier 2, the tower of which now extends 250 ft. above water line. Pier 3 was then visited; this pier is down to greater depths than pier construction has ever gone before, its cellular shaft being 220 ft. below water. Piers 4, 5 and 6, west of Yerba Buena Island, and the various East Bay piers, were all seen, as well as the tunneling work and the cable anchorages on the island itself.

The party next visited the Marin tower of the Golden Gate Bridge. This tower, extending 746 ft. into the air, is now entirely completed, save for the erection of the cable saddles. The concreting of the protective fenders of the San Francisco pier also proved of interest, as did the inspection of the finished pylons on the north and south sides of the Gate. These pylons have been concreted to a height of 157 ft. Work will continue on them after the cables have been strung.

Construction work on both of the bridges contains much of welding interest. The base plate of Pier 2, of the San Francisco-Oakland Bay Bridge is composed of sections of 4-in. steel plate. These sections were welded together to insure uniformity and tightness of the base. On this base will rest the 400-ft. tower, weighing more than 8,000 tons.

The cutting edges of the various caissons for the piers of this bridge were built up at the Moore Drydock Co.'s yard, by the use of the shielded-arc process of welding. Owing to the large amount of work involved, the undertaking was laid out as a production job, carried through by means of various jigs and devices for facilitating the shop riveting and welding operations. Over 138,000 lb. of weld metal were used for 400,000 linear feet of welding. The rod used was divided into sizes as follows: 5/32-in., 4,000 lb.; 3/16-in. (vertical rod), 55,000 lb.; 7/32-in., 51,000 lb.; and ¼-in., 28,000 lb.

Welding also played an important part in the construction of the Golden Gate Bridge. The caisson for the San Francisco pier had its cutting edges built up in the same manner as the caissons for the Oakland Bay Bridge. Welding has been used in several other construction operations. When the towers are finished, 60,000 ft. of rod have been used in welding the ornamental sheathing for the portals of the towers.

Iowa Meeting Called for Organizing Welding Shops

A meeting for the purpose of forming a state association of welding-shop proprietors and welding contractors has been called by Henry Malek, job-shop proprietor of Cedar Rapids, Iowa, for June 16th and 17th in Des Moines. Letters have been sent out announcing the meeting, and stating that the intention will be to affiliate with the National Association of Welding Contractors, Inc. Dale George, president of the National Association, will attend this meeting, it is announced.

Grand Rapids Welding Show Draws Large Crowd

The welding show promoted by Michigan Gases, Inc., formerly the Grand Rapids Welding & Supply Co., of Grand Rapids, Mich., held in that city on May 24th to 26th, had a registration of 900. The exhibitors were representatives of manufacturers whose products are distributed by Michigan Gases.

The demonstrators and salesmen cooperated with the sponsor company in making the show an educational exhibit rather than a sales meeting, although a great deal of equipment and supplies were sold.

The exhibitors were: Aladdin Rod & Manufacturing Co., American Arc Welders, The Bastian-Blessing Co., The Bingrod Co., The Lincoln Electric Co., Metallizing Co. of America, New Process Plow Welding Co., C. E. Phillips Co., Revere Copper & Brass, Inc., Sellstrom Manufacturing Co., Torit Manufacturing Co., and Westinghouse Electric & Manufacturing Co.

The exhibits and demonstrations included automatic flame cutting, rods for welding and hard-facing, welding of various metal by the gas flame and the arc, metal spraying, acetylene generators, arc welding units, reclaiming plow shares, goggles and helmets, and pipe bending. A demonstration of the use of Philgas in the home consisted of the baking of cookies and making coffee, which were served to all guests by girls dressed in Dutch costumes. The demonstrators wore white coats and red hats.

The "Crew" of the Grand Rapids Welding Show Take "Time Off" to Greet the Photographer.

The Welding Torch and the Portable Spot Welder (at Upper Right) Are Doing Their Bit in the Manufacture of Automobile Bodies in the Ford Exhibit

More Welding Demonstrations

Added to This Year's World's Fair Attractions . . .

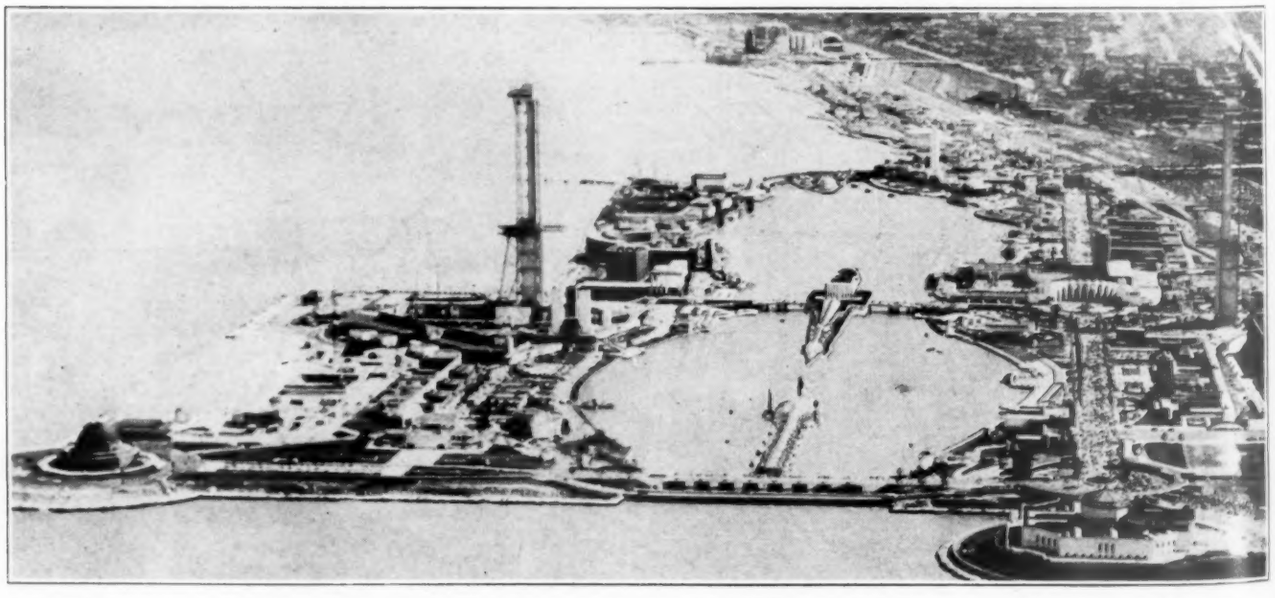
VISITORS to A Century of Progress (Chicago's World's Fair) this summer will find a wide variety of exhibits and demonstrations in the welding field. Of particular interest are the electric- and gas-welding demonstrations in the Ford building, which are being shown publicly for the first time. Another demonstration, not on display at last year's Fair, is a seam welder in the Westinghouse exhibit in the Electrical Building. New types of airplanes and trains, in which considerable welding is used, are on display at the Travel and Transport Building. The Union Carbide & Carbon Corp. and the Harnischfeger Corp. are demonstrating welding again this year as they did last summer. Also, General Motors have an interesting welding set-up, which is essentially the same as shown last summer.

As regards welding used in construction, the outstanding example is the Sky-Ride, with its column sections formed of three I-beams welded together, and its welded struts, diagonals, and other structural parts. This structure has already been described in detail in *The Welding Engineer,* as has also the Nash Tower, which is a parking machine located south of the Travel and Transport Building and represents a most excellent design involving cutting and welding that is perfection in themselves. Roof trusses of welded design are visible in the main wing of the Ford Building, and welded joints are also evident in the huge trusses supporting the roof over the assembly floor in the General Motors Building. The designs of these trusses have been described in past issues of *The Welding Engineer.* There is also the welded Crystal House, described in this issue, which is located in the court just north of the Electrical Building, also the welded Armeo-Ferro frameless house in the housing group on the mainland, this house having been built for last summer's Fair.

Steel floor joists in many of the buildings at the Fair are welded to the floor girders. Throughout the grounds, welded standards, flag poles and hand rails are evident on every hand.

64 Welds Made on Each Wheel

Huge crowds watch the making of all-welded Ford wheels in the Kelsey Hayes Wheel Co. exhibit in the Ford Building. Each wheel, containing 32 spokes, passes through eight welding machines, in proper order. The operations are made before the visitors' eyes. The hub shell of each wheel, consisting of two pieces and containing 15 spot welds, is assembled and welded at the factory, so

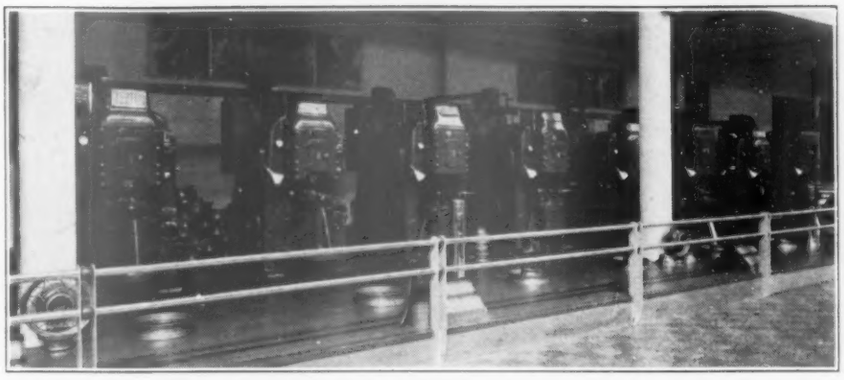


the welding that one sees is only on the 32 spokes. These eight welding machines operate as follows:

Machine No. 1 welds the first set of 8 short spokes to the rim of the wheel. Machine No. 2 welds the second set of 8 short spokes to the rim. Machine No. 3 welds the first set of 8 short spokes to the large diameter of the hub shell. Machine No. 4 welds the second set of 8 short spokes to the hub shell. Machine No. 5 welds the first set of 8 long spokes to the rim. Machine No. 6 welds the opposite end of the same set to the small diameter of the hub. Machine No. 7 welds the second set of 8 long spokes to the rim. Machine No. 8 welds the same set to the small diameter of the hub shell, completing the one-piece wheel.

The welder at each machine assembles the parts and turns on the machine, the rest being automatic. The machine clamps the parts in position, makes a weld, then revolves the wheel and welds the next spoke, then the third spoke, etc, until all eight spokes have been welded. The wheel is then removed by the welder and passed on to the next machine, which makes its eight welds, and so on, until the wheel is completed as it comes off the eighth or last machine.

No truing-up is necessary on the completed wheel. The maximum tolerance is 0.020 in. and all wheels must stand 32,000 lb. Olsen test. For exhibition purposes, one wheel is turned out every 15 minutes.



Each Wire-Spoke Wheel Passes Through These Eight Welders.

Flash Welding Steel Bodies for Automobiles

The extent to which welding has been adopted in the production of automobile bodies is indicated by the interesting exhibit of the Briggs Manufacturing Co., which is also a part of the Ford exhibit. Here the two sides of a Ford body is joined to the back panel in a flash welder (see illustration on the front cover) which makes two 55-in. welds. Mechanics assemble the pieces in the machine, and clamps operated by hand and by compressed air hold the pieces in position during welding.

In the next operation, the front roof panel is butt welded to the side and back panel assembly, and the final operation is performed in the body framing fixture, which is in reality a jig for holding a complete body. In this fixture, the transformers are also located for furnishing the power for all the welding.

In connection with this operation, there is on display for the first time the new portable spot welder developed and manufactured by the Briggs Manufacturing Co. This welder operates on a trolley, and the workman merely places the electrodes in position and pulls a trigger, the machine doing the rest.

In addition to the above, resistance bar welding is used to weld the completed assembly to the underbody. In the completion of the body, two Oxweld W-25 torches are used, these being equipped with automatic electric ignition.

The final body, which is of the two-door sedan type, minus doors, has no nails, bolts, screws or rivets, but contains about 430 welds—all made within a space of a few minutes.

There is also on display in the Ford exhibit a fatigue testing machine for testing the welds in the radius rods by subjecting them to a series of stress reversals. The machine applies a 2-in stroke to the two ends of the rod, and a 1⅝-in. stroke to the ball end. The rods thus are tested to destruction, and invariably they break well outside the welds.

A most interesting application of acetylene gas is to be found in the Ford foundry exhibit. Here, the soot given off from a pure acetylene flame is utilized to advantage in the casting of push rods. The molds, which are of the permanent type, are run through a small furnace before they are assembled. In this furnace, multiple flames of pure acetylene, fed from a Prest-O-Lite acetylene cylinder, deposit carbon on the lining of the molds to a depth of about 1/64 in., and this coating acts as an expansion cushion for the casting.

A great deal of interest is being shown in the assembling of complete Chevrolet cars in the General Motors Building. Owing to the amount of wood used in constructing the Chevrolet body, welding is not used to a very large degree. However, two flash welders are being operated part of the time to furnish the line with steel body frames, and bar welding and oxyacetylene welding is used sparingly. This assembly demonstration is similar to that shown last year.

Demonstrates Seam Welder With Short Timing Intervals

A demonstration in resistance welding is being given in the Westinghouse space in the Electrical Building. Here a 10-kw. Westinghouse seam welder, with timing periods controlled to 1½ seconds by means of an Ignitron timer, is welding steel strip. The Westinghouse company is also demonstrating an automatic welding head for metallic-arc welding, this exhibit being a hold-over from last year, when it created a great deal of interest.

The Harnischfeger Corp. again is housed this year in their all-welded booth in the Travel and Transport Building, with E. A. Cook back again as manager of the display. They are exhibiting a P & H Hansen arc welder of 300-ampere capacity, and have a welding booth equipped with safety glass. The Hansen arc torch is also on demonstration.

The Union Carbide & Carbon Corp. are giving the same show this year as last, in the pit in their extensive exhibit

in the Hall of Science. This year they are giving their liquid-oxygen demonstrations in an air-conditioned theater—a cool spot for the "coldest stuff." This company is responsible for a liquid-air demonstration being given each afternoon in the court of the Hall of Science.

Referring again to the Sky-Ride, the towers and cableways were thoroughly inspected by the Overland Construction Co. just prior to the opening of this year's Fair. All welds were found to be 100% intact with no evidence of distress, according to W. H. Lotts, of the Overland company.

With the additional welding exhibits and demonstrations being shown for the first time this year, in addition to those retained from last year's Fair, it is anticipated that the millions of visitors who will throng the Fair grounds this summer will obtain a clearer conception of the importance of welding to industrial production and maintenance, and the dependence that one places on it, not only in the business world, but also in every-day living, with its comforts and conveniences.

Rail-Welding Chart Should Have Specified Electrode

The diagrams and explanation of the "Method and Procedure of Welding Battered Rail Ends," given on page 20 of the May issue of *The Welding Engineer*, was developed for use with the G-E Type W-90 electrode, and should have carried the wording, "Using General Electric Type W-90 Electrode."

Manufacturers' Literature Wanted by Welding School

The building up of a complete trade-literature file on welding and allied processes is being undertaken by Edward Scott, president of the Cleveland School of Welding. This library of books and manufacturers' catalogs will be available to "outsiders" as well as to students of the school. In compiling this reference library, manufacturers can be of assistance to Mr. Scott by sending him samples of all their literature. The wide diversity of information wanted can be illustrated by taking pipe welding as an example. This section of the library would include all textbooks on the subject, and manufacturers' literature pertaining to pipe, its manufacture, chemical and physical properties of the metals used, information on the selection of pipe, pressure-temperature recommendations, fluids carried, information on flow and on pressure drops, cutting and preparing pipe, lining it up for welding, etc. An exhaustive collection of literature is also wanted on the welding of castings, non-ferrous metals, etc.

Get "*H. O. T.*" on Welding

■ By H. O. T. RIDLON

[This section is dedicated to Better Welding and Better Welding Shops. Suggestions and criticisms are invited.]

News and Gossip Picked Up on the Road

Well, your old Maestro has been doing a good deal of running around these here now Central United States for the past few months, and I hardly feel like the usual line of chatter, but more like the Walter Winchell of this durn industry. Don't get me wrong when I euss it a bit, for, as I believe some great Greek once said, Baby, I used to like it, but now I loves it.

* * *

I understand that "Steve" who ran the first welding shop in Fort Wayne, Indiana, has returned north and is thinking about going to work for a certain red-headed gent who runs a welding shop and supply business in that same town. Sounds like a great team, and if they do come to terms, here's to much luck. They should both have it, for they are deserving.

* * *

Jumping over to Cleveland, Harvey Winkleman, whom I guess every one knows in that part of Ohio, if not for welding, for eating, has developed what looks to me like a real electrode holder. Hang on to it, Wink, and don't let the big bad wolf get it, for it sure looks like you were headed to be among the near great with such a development.

* * *

Warning to you guys that have to go to Youngstown, Ohio. Get your business done in one day and scram along out of town, for the hotels are lousy, and although the restaurants aren't anything to get up in the middle of the night to write home about, I guess the average man could stand a few days of it. But business was OK for me there so I reckon I shouldn't put in too big a squawk.

* * *

Down in Huntington, W. Va., I got a great bounce out of life. Got hold my good friend, A. P. Martin, who runs the Huntington Forge & Machine Co. Talked about ye good old days when Bill (pardon me, Mr. W. F.) Stoody used to work for him. In one of the issues of *Fusion Facts*, that swell little free magazine put out by the Stoody Co., Mr. Stoody once told of some of those early-day experiences down in that country in his line which he calls "Arcing Along." I saw some of the old torches Mr. Stoody built in those days, and Mr. Martin said, "You know Bill was always fooling about trying to make up some kind of hard metal."

* * *

In Pittsburgh, ah such hospitality, yes sir, it made me think I was in the good old South.

* * *

The thought for the month: "I wonder if all these strikers really have something to strike about, or if it is that they just don't like to work."

Program Announced for A. S. T. M. Meeting

Papers and reports containing valuable information to the metallurgical and metals-working field will be presented at the 37th annual meeting of the American Society for Testing Materials, to be held at Atlantic City, N. J., June 25th to 29th. All sessions will take place in Chalfonte-Haddon Hall.

Technical contributions in the metals field will involve creep tests and properties, effect of sizes of test specimens, corrosion of steel under water, the design and protection from corrosion of pipe lines, impact strength of die castings, and application of the 18-8 stainless-steel alloy in welded construction under severe corrosive conditions.

Papers on testing and testing apparatus include such subjects as a high-speed fatigue testing machine, and effect of notches and laws of similitude in testing.

Endows Fellowship on Steel-Floor Design

The American Institute of Steel Construction has decided to endow a Research Fellowship at Lehigh University, Bethlehem, Pa., which goes into effect immediately and will extend over a period of two years. The work will relate to research on steel floor construction and will involve the design of battledeck floors, made of flat steel plates welded to steel beams, to carry concentrated live loads.

During the past several years the American Institute of Steel Construction had the National Bureau of Standards carry on a comprehensive research on battledeck floors, which developed valuable data regarding fireproofing and behavior under distributed loads. The fellowship at Lehigh University will continue this work and develop it in the particular field of bridge floors.

Film on Gas Welding Available for Meetings

"The Prosperity Process" is the title of a new two-reel motion picture that has just been produced by the International Acetylene Association, 30 East 42nd St., New York, N. Y. This picture shows the application of the oxyacetylene process of welding and cutting metals to a wide range of industrial problems in the repair, reclamation and production of metal parts.

The picture is suitable for technical society meetings, engineering colleges, technical, high and trade schools, student sections of the engineering societies, superintendents' meetings, safety meetings, foremen's club meetings, and other similar gatherings. It requires approximately 25 minutes for showing. The film is available in 16-mm. size, which can be shown on standard portable 16-mm. motion-picture projectors.

Arrangements to borrow this film can be made through the office of the Secretary of the Association. Organizations desiring the use of this picture should specify the date most convenient for its showing, together with an alternate date.

Metalweld Holds Three-Day Show for Easteners

Exhibits and demonstrations of welding by the oxyacetylene, electric and thermit processes, and of metal spraying, were held on the evenings of May 21st, 22nd and 23rd at the plant of Metalweld, Inc., at 26th and Hunting Park Ave., Philadelphia, Pa., who were hosts to purchasing agents, superintendents, plant managers and chief engineers of many industrial plants throughout the Middle Atlantic states on those three days. Various manufacturers of welding equipment and accessories cooperated in the venture.

Among the spectacular demonstrations was the blowing of a hole through the center of a very large steel billet by means of an oxygen lance, as well as the actual welding of a boiler section, in which staybolts were renewed, sheet built up, tubes welded and renewed, a ring installed in a manhole, and a section of the boiler patched. A thermit weld was another feature of the exhibit.

Practical demonstrations of metal spraying included the building-up of shafts and rolls with high-carbon steel, and the spraying on of various corrosion-resisting metals and of decorative coatings. Each guest was presented with an ash tray of cast iron which was then sand-blasted and coated to his specifications by metal spraying.

The exhibit brought guests from all parts of the East, as far south as Columbia, S. Car., and north to Boston.

Weld Metal Superior to Best Open-Hearth Product

By EVERETT CHAPMAN
Lukenweld, Inc.

(Abstract of paper read before meeting of the American Iron & Steel Institute, in New York City, May 24th.)

Modern weld metal is a freak metal. It is freakish in that similar physical characteristics cannot be produced in the open hearth today. Compared with open hearth steel of the same chemical analysis, it shows markedly superior physical characteristics. At a carbon content of from eight to ten points, it will exhibit a tensile strength of 65,000 lb. per sq. in. At that tensile strength, it will show a degree of ductility, as measured, of 35% elongation in 2 in.

These figures can hardly be reconciled with the properties of any mild rolled steel that we know today, and they become more surprising when it is realized that this material shows these properties in the cast condition. A cross-section through a weld made in one pass shows an obvious columnar type of crystallization. Correlative properties such as impact values, endurance values and corrosion resistance show values which are also out of the ordinary for material of this analysis and structure.

Here is a material in a condition which, by all the tenets of usual metallurgy, should exhibit properties inferior to the product of the rolling mill. It is believed that the seat of these extraordinary values lies in the extreme cleanliness of the weld metal as deposited by modern welding techniques, which protect the fusion deposits from the atmosphere. The endurance value of this cast material, which should show directional weaknesses, is in the neighborhood of 30,000 lb. per sq. in., and this exceeds the values as exhibited by the product of the open hearth.

Some time ago, various specimens of steel were broken under the microscope, which specimens were purposely made with different degrees of oxide inclusions, and the mechanism of their failures was observed microscopically. It was interesting to note that the grains of the cleaner steels developed a marked number of slip bands under load before failure. In contrast, the more oxidized steels failed through the grain boundaries before the grains themselves developed any slip bands. The more finely divided oxides in the oxidized steels were found to have been excluded to the grain boundaries, which effectively isolated the grain elastically to a point where the breaking load was not high enough to deform plastically the material in the grain.

Some place in this conglomerate picture that modern weld metal presents, would seem to be a clue that steelmakers could well afford to investigate in their search for better steels. Today, the situation presents a picture in which the modern fusion deposits which can be used for joining rolled-steel products have characteristics and physical properties which are superior to the material they join.

To sum up, the physical properties of these modern weld metals with respect to the mild steels they join and, what is more important, to the higher strength alloy steels in conjunction with which they can be used, offer a challenge of considerable magnitude to the open-hearth practices of today. Modern engineers, engineers with imagination, have at their disposal, if intelligently used, a material surrounded by a commercial technique which can sew together and integrate a mechanical structure from a series of composite pieces of rolled-steel material to meet service conditions in accord with the next step in industrial revolution.

National Conference on Use of Models

A National Conference on the Use of Models in Technical Education and Research will be held at Cornell University, Ithaca, N. Y., June 19th to 21st. Two groups, structural and hydraulic, will hold their sessions concurrently. Among the papers on the structural program are several on photo-elasticity.

Louisville Welding Group Elects Officers

The Louisville (Ky.) Welding Association, Inc., which is affiliated with the National Association of Welding Contractors, Inc., has elected the following officers: President, John W. Rolli; vice-president, D. M. Hunt; secretary, James W. Pool; and treasurer, Earl F. Greer. Nine shops comprise the association. The group meets the first Tuesday of each month.

At present, they are working out a "Code of Fair Prices" and have posted prices for cylinder-block and head welding, both in and out of the car. The prices allow garages a discount of 20%. Vice-President Hunt states that the members of the association made money this winter on this type of work, which they could not have done under the ridiculously low prices prevailing prior to the formation of their association.

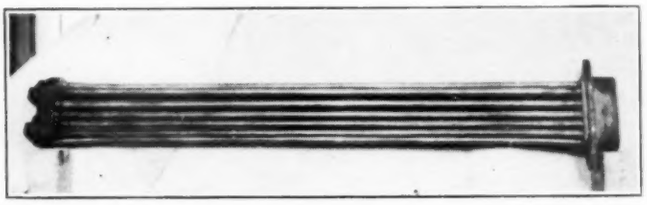
The group is now discussing the cost of welding cast-iron boiler sections, in order to arrive at what they would consider as fair prices for this class of work.

Brazed Water Heater Tested to 850 lbs.

An instantaneous type of water heater, the construction of which involves some interesting brazing work, is being manufactured by the Flour City Oxwelding Co., Minneapolis, Minn.

The end castings of this heater are steam bronze and the tubes are seamless copper. The heater is assembled as shown in the illustration, and is set on end in a city-gas burner, which heats the end assembly evenly and saves materially in oxygen and acetylene costs. While the assembly is being preheated to a brazing temperature, the welder is free to do other work, and he knows the exact time required to preheat the job. After one end is brazed, the heater is reversed and the same procedure is used on the other end. Sil-Fos, a low-temperature brazing alloy, is used. With the brazing completed, the assembly is given an 850-lb. hydrostatic test. Very few of these assemblies show any leaks.

The sizes of these heaters vary materially and are dependent on the size of the boiler into which they are installed and the water capacity of the system.



Bronze Castings and Copper Tubes Are Brazed Together to Form This Heater.

Chicago Shop Owners Vote to Change Name

The Chicago group of job-shop owners and welding contractors formerly organized as the Chicago Chapter of the National Association of Welding Contractors, Inc., voted at their June 6th meeting to withdraw from the National Association. They have applied for a state charter to operate under the name of the Chicago Welding Shop Owners Association. There is no change in officers.

Pacific Coast to Have Machinery Exposition

The Machinery and Equipment Exposition, to be held in Los Angeles, Calif., during "Market Week," July 30th to August 4th, promises to be of importance and interest to industrialists and manufacturers of the Pacific Coast. The Shrine Auditorium has been chosen as the site of the exposition, with an outdoor ground area available for the actual demonstration of machinery and equipment which cannot be shown in operation indoors.

In view of the large number of projects planned and under way on the Pacific Coast, involving investments running over a billion dollars, this exhibition of new machinery used in construction work, road building, and in the mining and power fields, will be of widespread interest. It will include exhibits and demonstrations of different types of welding equipment.

Tank Builder Found Not Guilty When Vessel Fails

A law suit was recently concluded in Louisville, Ky., in which welding was very much involved and in which the defendant, W. E. Caldwell & Co., of that city, was exonerated by the jury of any blame or responsibility in regard to the rupturing of an asphalt tank of welded steel, which had been built by that company.

The history of the affair leading up to the suit was as follows: Over a year ago a certain manufacturer ordered a rectangular-shaped, flat-bottom, open-top tank of definite specifications. W. E. Caldwell & Co., who built the tank, claim that they were not asked for recommendations as to design or size of material, nor were they told what the tank was to be used for. The tank was constructed, steam coils built in, and the unit was delivered to the buyer, who accepted it.

As brought out in the testimony at the trial, the tank was to be used to heat asphalt, but after the tank was put into service it was found that the steam coils did not give sufficient heat. Thereupon, the coils were removed by the owner of the tank without consulting the manufacturer, and an open flame was used to heat the bottom of the tank.

Just recently the tank blew up, after having been in service about a year, and the operator received injuries from which he died. Between the time of the accident and his death, the operator stated that he had been ordered to heat the tank very slowly and that possibly he had applied the heat a little too fast. Heat applied to the bottom generated pressure which could not escape through the mass of cold, solid asphalt above, and thereby blew the bottom out of the tank, seemed to be the theory of the cause of the accident advanced at the trial and accepted by the court.

The defendant was sued by the administrator of the deceased workman's estate; however, as brought out in the trial, the real power behind the suit was the insurance company carrying the compensation insurance on the deceased. The plaintiff claimed that the tank was not properly constructed and the welding was faulty, therefore it gave way.

Before the jury returned to confer, Judge Hubbard of the Common Pleas Division of the Circuit Court gave them five separate instructions, three of which are as follows, these being of particular interest to welding contractors:

1. If you believe that the defendant knew what the tank was to be used for, and in addition knew the manner in which the tank was being used at the time of the accident, and also that they did not use due diligence and care in manufacturing, then you are to render your decision in favor of the plaintiff.

2. If you believe the operator was negligent in his duties, then irrespective of anything else your findings should be in favor of the defendant.

3. If you find the defendant did not know the manner in which the tank was to be used, then your findings should be in favor of the defendant.

The jury's verdict was in favor of the defendant.

Fan Sprayed With Lead to Resist Attack by Fumes

To increase the life of a 6-ft. 6-in. rotor exhaust fan, together with its housing, which was about 9 ft. square, this equipment was sprayed with lead by the metal-spraying process. The contract was awarded to Millard & Lesperance, metal-spray contractors, of Grand Rapids, Mich. This fan and the housing, which was partly welded, were for a large eastern chemical company, to be used for drawing off sulphuric-acid fumes. These fumes have materially decreased the life of fans used in such service, and it was believed that a coating of about 0.012 in. of lead applied to the surface would increase the life of the equipment sufficiently to warrant the additional cost.

St. Louis Group Hears Talk on Maintenance

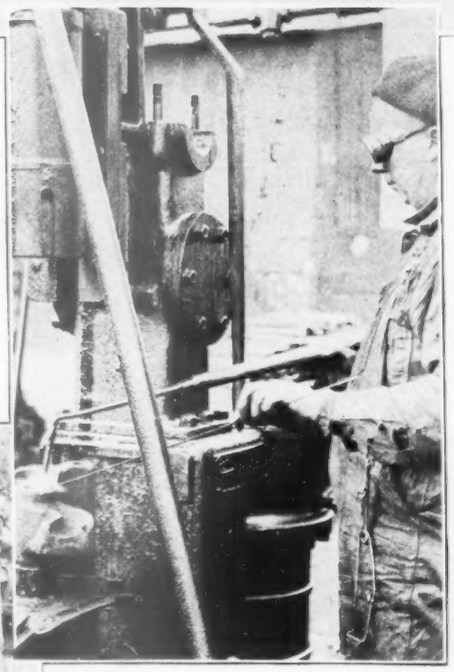
"Application of Welding in Maintenance Repair Shops" was the subject of a talk by Ralph E. Godrian, of the St. Louis Public Service Co., before the St. Louis Welding Society, held on May 25th. For a number of years Mr. Godrian has kept careful records of many interesting and difficult jobs, and he is well versed on costs and on savings to be realized through welding.

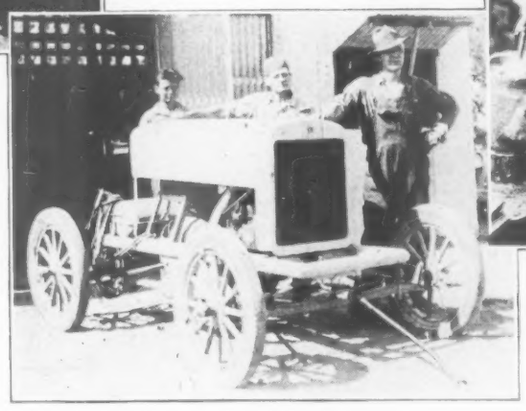
WELDING NEWS IN PICTURES

• The welds are still intact, following an explosion and fire which destroyed an arc-welded mill building at Lackawanna, N. Y. (Photograph courtesy Lincoln Electric Co.)

• San Francisco firemen being drilled in the proper use of the cutting torch.

• A Western railroad company is reclaiming car knuckles by building up with the oxyacetylene torch and then swedging out the hole, using a compressed-air-operated machine made from scrap material.





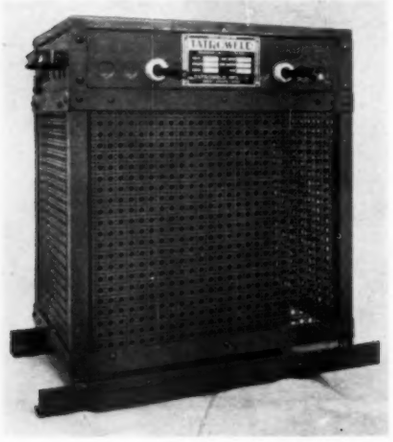
• With this jig, the operator can easily turn the worn pump casing as the interior is being hard-faced with the arc. (Photograph courtesy Air Reduction Sales Co.)

• Gasoline-driven electric welding unit made from odds and ends. The framework of tubes adds further water-cooling surface.

New Equipment

Alternating-Current Welder for Light or Heavy Material

The "Tatroweld" arc welder, an alternating-current unit, is being marketed by The Tatroweld Manufacturing Co., West Union, Iowa. This new device has an output of 85 to 165 amperes, it is claimed, and weighs only 167 lb. Current regulation is obtained through a



The "Tatroweld" Welder, Weighing Only 167 Lb., Has an Output of 165 Amperes.

5-point control switch. The unit operates from a 220-volt line, and is said to give satisfactory service when used for welding light material as well as for heavy castings and forgings. It will handle electrodes up to ¼ in. in size.

Rego Offers Universal Shielded-Arc Electrodes

A universal shielded-arc rod (No. 333A), stainless-steel gas rods (No. 10A) and electrodes (No. 30A) have been added to the line of "RegOroDs" sold by The Bastian-Blessing Co., 240 E. Ontario St., Chicago, Ill.

The No. 333A rod is adaptable for flat, vertical and overhead welding and produces welds that meet A.S.M.E. Code specifications for Class 1 and Class 2 vessels. The coating protects the arc and permits the use of high welding currents, giving high speed of application. Reversed polarity is recommended. These electrodes may be had in five diameters, ranging from 5/32 to ⅜ in., all in 14-in. lengths.

The new stainless-steel rods and electrodes are recommended for the 18-8 alloys, but can be furnished in various compositions to correspond with the analysis of the sheet to be welded. These rods and electrodes are available in six diameters, ranging from 1/16 to 5/32 in.

Electrodes for High-Carbon and High Strength Steels

Difficulty in arc welding steels containing more than 0.20% carbon is overcome by a new heavy-coated electrode, known as "Murex Special A," it is announced by the Metal & Thermit Corp., 120 Broadway, New York City. This new electrode, an improvement of a previous design, hinders the migration of carbon from the parent metal to the deposited metal when welding and assures a more ductile deposit. Sound, dense, X-ray-clean welds, having excellent penetration, can be made in high-carbon steels with perfect ease, it is claimed. The deposit, containing a small quantity of nickel, has unusually good physical properties and, when stress-relieved, all-weld-metal specimens invariably show clean full-cupped fractures under test. The tensile strength of these deposits is 73,000 lb. per sq. in., the yield point 59,000 lb. per sq. in., the elongation in 2 in. is 31%, and the reduction in area is 63.5%, it is reported.

Other recently developed "Murex" electrodes, designed for use with the latest high-strength steels, now make it possible to obtain welds with tensile strengths of 85,000 to 100,000 lb. per sq. in. Such high strengths are obtained by including nickel or molybdenum, or a combination of these elements, in the deposited metal. For example, one of the new electrodes, depositing 2½% nickel, is being used extensively

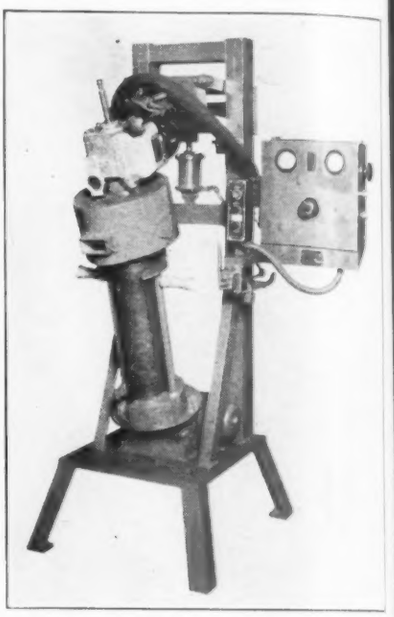
A Weld in High-Carbon Steel Produced This Perfect Fracture at a Tensile Strength of 73,000 Lb.

in the welding of steels of this same analysis for low-temperature work where welds must show a Charpy impact resistance of 10 to 24 ft.-lb. at the extremely low temperature of —75° F. The physical properties of this weld metal, it is said, are also extraordinary. Tensile strengths average 86,000 lb. per sq. in. and yield points 72,000 lb. per sq. in. The elongation in 2 in. is 25.5%, and the reduction in area is 64%. Almost without exception, test specimens show clean, fully cupped fractures.

Muffler Assemblies Now Welded Automatically

Automatic machines for welding automobile muffler assemblies by the shielded-carbon-arc process have been announced by The Lincoln Electric Co., Cleveland, Ohio. The machines, equipped with "Electronic Tornado" welding heads, are said to have a production capacity of 115 mufflers per hour.

The equipment used consists of two



Vertical Machine for Muffler Welding.

machines—one vertical and one horizontal.

Using the vertical machine, shown in the illustration, the operator places the muffler in position, lowers the welding head, edge welds the tubes in place, raises the head, turns the muffler upside down, and welds the pipes on the other end. The complete operation requires 30.5 seconds. Approximately 118 mufflers per hour may be welded with this machine. Actual welding is at the rate of 63 ft. per minute.

A second machine lap welds muffler tubes for connection to the exhaust pipe. Floor-to-floor time is 112 mufflers per hour.

In one installation in a large plant two men operate four of these automatic welders.

These welders can be designed for welding various types of mufflers. The welding head remains stationary while the parts being welded revolve under the arc. The head is of the same type as that employed for hundreds of different automatic welding applications.

Welds produced by these machines are made by a shielded arc, insuring weld strength greater than that of the base metal and equal to it in ductility. The welds also show greater resistance to corrosion.

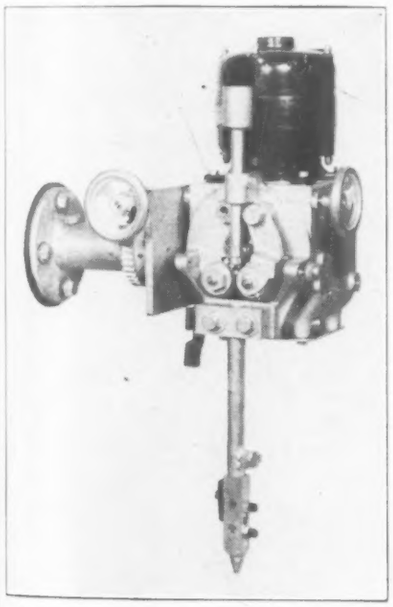
Simplified Design of New Automatic Head

Simplicity in design, control and adjustment to work, and low maintenance are features claimed for the improved Type WFA automatic arc-welding head recently announced by the General Electric Co., Schenectady, N. Y.

One small motor drives the electrode-feed rollers through a simple worm reduction gear and three-speed transmission. At any of the three speeds, selected to suit the electrode size, current, and rate of deposition of metal, the electrode is fed at a uniform rate and the arc voltage is accurately maintained, it is said. One small rheostat is the only adjusting element necessary. This means quick and accurate control of the electrode feed, as all other operations are fully automatic.

Handwheels swing the nozzle through complete circles in two planes at right angle to each other, thus permitting universal motion of the head. This feature provides a very simple and accurate means for positioning the electrode with respect to the work or for following an irregular outline as the weld progresses.

The welding head has an insulated mounting support, carrying an end plate,



New General Electric Welding Head.

which can be rotated and to which is attached an aluminum-alloy gear case containing the speed-reduction and transmission gears operating entirely submerged in grease. The motor has adequate power not only to feed the electrode but to straighten it as it comes off the reel. A circular aluminum-alloy plate carrying the nozzle, wire guide, feed rollers, and knob for adjusting the feed-roller pressure is mounted on the left side of the gear case and can be rotated by means of a handwheel through a worm and worm wheel. A gear-shifting dial on the right side of the case permits ready selection of the desired transmission ratio.

The motor is controlled through an enclosed panel. An instrument panel carries meters reading arc voltage and current, an arc-voltage-adjusting rheostat, start-stop buttons, a forward-reverse switch for the electrode-feed mechanism, and a selector switch for either manual or automatic operation of a travel carriage if the latter is used.

The standard Type WFA automatic arc-welding head and control is arranged for operation from a 60-volt direct-current supply.

New Portable Tensile and Bend Testing Machine

The Airco Portable Tensile and Bend Testing Machine is a compact, comparatively light machine that can be carried right to the welding job so that welded specimens can be tested on the spot, rapidly and easily, according to an announcement from the manufacturer, the Air Reduction Sales Co., 60 East 42nd St., New York, N. Y.

The machine consists essentially of an oil pump, a hydraulically actuated piston or ram, two heads (one fixed and one movable) for gripping the test specimens, and four symmetrically located steel shafts, two of which transmit the piston motion and load to the movable head, and the other two shafts maintain the alignment of the two heads and prevent the introduction of bending stresses in the tensile test specimen.

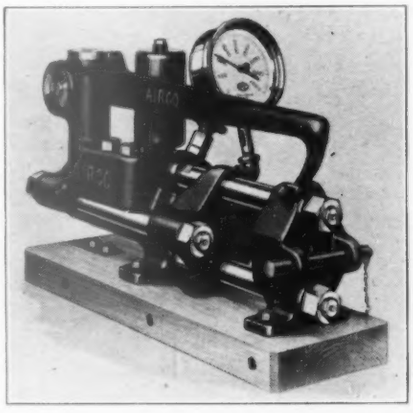
The downward force on the pump lever is magnified four hundred times in the load applied to the test specimen. This magnification of force, together with the large piston displacement of the oil pump, enables specimens to be tested rapidly and with but slight effort

The load on the test specimen is indicated on a 6-in. pressure gage. This gage is said to maintain its accuracy under the strains of usage and slipping.

The machine is calibrated, using clean lubricating oils covering the range of viscosities sufficient to assure that the viscosity of the oil does not materially affect the accuracy of the machine. Any good, light crankcase oil can be used. A filter prevents any dust particles from entering the oil passages.

With a few strokes of the operating lever, after the specimen is set up, the operator of the "Airco" testing machine can apply a direct load up to 40,000 lb. to specimens from 9½ to 10 in. long, up to ½ in. thick, and up to 1½ in. wide. Then, by using specimens of smaller cross-sectional areas than the maximum 1½x½ in., loads equivalent to 150,000 lb. per sq. in. or higher can be applied. With these reduced-size specimens, the whole range of various types of steel can be tested. The stroke of the movable head is up to 2¾ in., more than ample for practically any of the ferrous or non-ferrous metals. The operation of the machine requires but little effort. It is said to be rapid, simple, and sure, and readings are accurate to plus or minus 2%.

For the bend test, the machine is provided with an anvil which fits into the movable head, and which bends the specimen against a pair of supports set 3 in.



"Airco" Portable Testing Machine.

apart and cast integral with the body of the machine.

An important feature of this testing outfit is its easy portability. A solid hardwood base upon which the machine is permanently mounted forms part of the packing case. Sides and top of the case are assembled with screws. A few minutes with a screw driver frees the machine for immediate use, or packs it for shipment to another job. A separate box contains the gage, carefully packed to protect it in transit. The entire unit, machine and case, weighs only a little more than 200 lb. and can be handled freely without damage to the machine.

New Technique for Building-Up Rail Ends

A new method for building-up rail ends, using a newly developed filler rod and flux and a P&H Hansen arc torch, has been developed by the Harnischfeger Corp., 4513 W. National Ave., Milwaukee, Wis., according to an announcement from D. B. Patterson, executive vice-president. Many months of laboratory and shop work, combined with actual service tests, show that the new process has advantages of speed, low cost, and long life of the deposited metal, and indications are that the resurfaced rail, when it finally becomes worn, can again be built up without removing tthe old surfacing material.

The special new 3A filler rod used for this work is a complex alloy having a density of 8.28 to 8.30, a tensile strength up to 80,000 lb. per sq. in., and the peculiar ability to withstand pound-

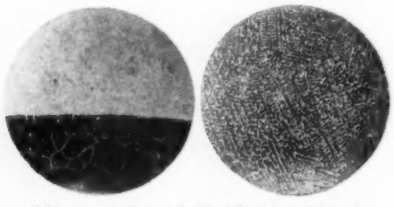
ing action after being laid as a surfacing material.

In its ability to "work harden" it is not unlike 12%-14% manganese steel, excepting in its initial hardness. It will withstand pounding to an unusual degree without battering or bulging, it is claimed. A rail surfaced to a height of ⅛ in. showed a Brinell hardness of 223 to 235. After being struck 100 blows of 150 ft.-lb. each, the hardness increased to 300. Continued pounding increases hardness little beyond this point.

Special "P&H Hansen" Arc Torch.

Should initial or final work-hardness be desired, this can be accomplished by a slight change in composition. However, tests show that too high a hardness is not desirable because of the tendency to form small cracks. The preferred hardness for practical use is between 302 and 350 B. H. N.

In the application of this new process, the rail end or crossing casting to be surfaced is first heated by the flame



Micrographs of Surfacing Metal.

(Photomicrograph at left shows rail head surfaced with A3 metal, magnified 100 times. Along the junction of the two metals, small roots appear to be reaching periodically from the surface metal down into the parent metal. Here the surfacing metal has been united with the free ferrite of the parent metal. At right is shown the structure of the surfacing metal when properly etched.)

of the arc torch, with the positive electrode held about an inch away and moved slowly back and forth. When sufficiently hot, the rail or casting is given an application of a generous amount of flux, and is further heated until a glazed surface appears.

Without removing the flame, the operator inserts a filler rod and holds it there until it is just ready to melt and a drop to fall off. Then it is lowered to contact with the piece to be resurfaced. After a little experience, the operator will know by the "feel" whether or not bonding action has taken place, by rubbing the rod end lightly over the heated surface. During the bonding action, the flame should be concentrated by lowering closer to the work and moving slowly along the surface. The rod should be kept well within the flame, at a point where it will not melt too rapidly, yet fast enough to properly adhere and smooth out in a bright molten pool. With a little practice, a well spread and even surface is obtainable.

The bonding action in this process is rapid and it is not essential that a pool be kept liquid for a long time to insure a strong bond. In fact, it is recommended that the operator keep the temperature of the unit as low as possible, but concentrate the required heat directly on its face. When a unit has been surfaced, no subsequent treatments are required. After an operator has developed sufficient technique, very little, if any, grinding will be found necessary in the ordinary run of work, and no peening whatever is required.

As with all new processes, the operator will need a certain amount of practice, since the technique is essentially different from the methods to which experienced electric arc and oxyacetylene operators are accustomed.

A. C. Welder Adjustable for Voltage Fluctuations

To compensate for irregular line voltages, the "Wilco" alternating-current welder is now being provided with a tuning or adjusting device for tuning to high or low voltage. Thus the welder can obtain the exact electrode voltage he desires, and hence get best results.

The "Wilco" machine is now available in a larger size rated up to 200 amperes and is adjustable as low as 50 amperes for welding light sheet metal, according to the Wilco Co., 446 State Ave., Kansas City, Kan.

New Welding Helmet Has Adjustable Chin Rest

Several improvements were recently made in their arc-welding helmet No. 202, according to an announcement from the Sellstrom Manufacturing Co., Chicago, Ill. The new helmet is light and airy and can be adjusted in almost any direction to satisfy the wishes of the wearer and is adjustable to fit any size or shape of head. The new helmet also has an adjustable chin rest. The helmet moves freely with the head, yet fits comfortably. Through the use of coil springs it can be quickly swung up out of the way, and when so placed will stay put.

Ball-Seat Needle Valve for Oxweld Blowpipes

A new type of needle valve — the ball-seat needle valve — is now being supplied on most Oxweld blowpipes, according to a recent announcement from The Linde Air Products Co., 30 East 42nd St., New York, N. Y. The new valve design is said to be a great improvement over the old, and is interchangeable on all of these blowpipes now in service.

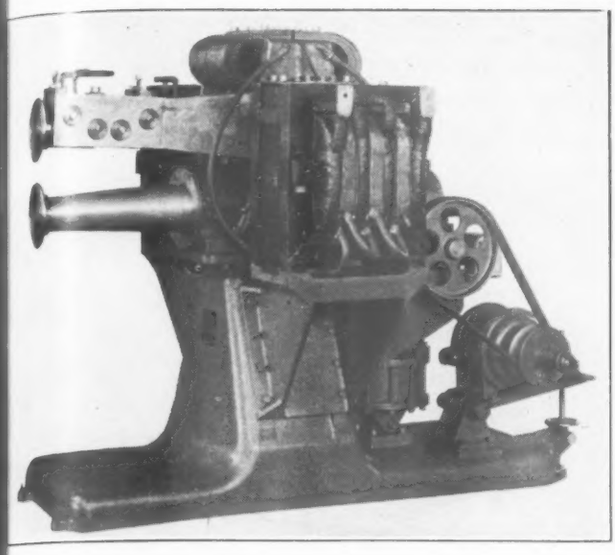
The new valve contains a seat between the blowpipe body and the needle valve which is made of a hardened and highly polished stainless-steel ball, held in a cage at the end of the valve stem. Tests have shown this type of seat to have excellent sealing properties. The valve closes readily with but the slightest effort of two fingers, and opens with equal readiness. The polished ball frees itself readily of all foreign particles that might impair the gas-tight seat.

Views of Ball-Type Needle Valves.

Copper "Tube-Turns" Now Available

A line of copper Tube-Turns has been introduced to the trade by Tube-Turns, Inc., Louisville, Ky. These copper bends are made to the tube-size scale which is standard with coppersmiths, and are available in 10 sizes ranging from 2 to 12 in. in diameter.

Illustrating Various Sizes of Copper "Tube-Turns."



This Seam Welder Maintains a Constant Roll Pressure and Obtains High-Strength Welds in Heat-Treated Aluminum Alloys.

Seam and Spot Welders for Aluminum Alloys

For the resistance welding of heat-treated aluminum alloys, The Taylor-Winfield Corp., Warren, Ohio, have developed a line of spot and roll seam welders, having twin-transformer construction, which is said to give uniform distribution of power with minimum reactance and resistance losses.

In the roll seam welder, which is illustrated, the lower roll is the driven roll, eliminating all unnecessary weight from the upper roll, which is carried at the end of an arm made of a special light alloy, giving high strength and good electrical conductivity.

This upper-roll carrying arm is operated by a cushioned air cylinder, giving a very smooth action, and the roll pressure is adjusted and maintained uniformly through a pressure-reducing valve. These features are particularly valuable, because the slightest hammer-blow effect, when the rolls come in contact with the work, has a tendency to bed them into the alloy, adversely affecting the welding.

An infinitely-variable-speed drive permits a welding speed range of from 40 to 240 in. per minute. The welding heat is controlled in very close steps through an auto-coil with a 20-step regulator. It is recommended that a General Electric Thyratron unit be used for proper interruption of the welding current.

Aluminum heat-treated alloys welded by this equipment develop high strength at the joints, it is claimed, and the heat-treated qualities of the alloy itself are left unaffected.

New Type of Screen Filter for Oxygen Regulators

An improved screen filter is now being incorporated in Oxweld oxygen regulators, according to an announcement from The Linde Air Products Co., 30 East 42nd St., New York, N. Y. This improvement gives greater protection against foreign matter entering the regulator, it is claimed. The flat screen across the inlet has been replaced with a double, cone-shaped bronze screen. A cone of coarse-metal screen fits inside one of finer mesh, and both are held in the inlet nipple by a newly developed locking screw.

Welding Rods Added to "Imperial" Line

A complete line of "Imperial" gas welding rods has been added to their listings of gas welding and cutting equipment by the Imperial Brass Manufacturing Co., 522 S. Racine Ave., Chicago, Ill. These rods will be marketed through the same distributing channels as the company's welding equipment. New literature covering the new rods is available. Among the new rods are a high-tensile steel rod, a high-carbon steel rod, and several bronze rods.

Trade Literature

"The Progress of Bronze Welding" is the subject of a pamphlet recently issued in a new edition by The Linde Air Products Co., 30 East 42nd St., New York, N. Y., and describing procedures for work on cast iron, malleable iron, steel, wrought iron, copper, brass and bronze. The same company has also published a new pamphlet entitled "The Principles of Bronze-Welding," which discusses the compositions and strength characteristics of bronze-welding rods, the underlying theory of the flowing of bronze-weld material, and elements of welding technique.

The wide range of temper of "Bingrod" is brought out in a new bulletin on this hard-facing rod, issued by Michigan Gases, Inc., Grand Rapids, Mich. With a carbonizing flame and no flux, a Brinell hardness as low as 220 can be obtained, it is claimed, and, at the other extreme, an oxidizing flame with a liberal amount of flux used will result in a hardness of 502 Brinell. It is said that any hardness between these two points can be obtained by regulating the torch flame and the amount of flux used.

"Welding Rod Coatings" is the subject of an article by L. B. Bliss, of the Foote Mineral Co., Inc., Philadelphia, Pa., appearing in that company's house organ, *Foote-Prints*, for June, 1934, copies of which are available for general distribution. The author discusses uniformity, composition, and manufacture of coated electrodes, and the problems of gassing, are stability and slag.

"The Testing and Qualification of Welders" is the title of a 24-page booklet outlining simple tests for measuring the ability of welders. Separate sections discuss in detail the fracture test, the bend test, the tensile test, and the observation test. A summary of existing and pending qualification tests for welding steel plate and pipe are given. Copies of the booklet are available from The Linde Air Products Co., 30 East 42nd St., New York, N. Y.

"How to Select Insulated Cable" is the title of an 80-page reference book published by the General Electric Co., Schenectady, N. Y. Designated as GEA-1837, this publication covers cable for the transmission and distribution of electric power at normal frequencies, and presents in convenient form the information that is required in determining the cable best adapted for any one particular installation.

The gas welding of corrosion-resisting steels, with recommended practices, is discussed in a pamphlet issued by The Linde Air Products Co., 30 East 42nd St., New York, N. Y. For convenience of classification, these alloys are divided into eight groups, for each of which a detailed discussion is given on welding procedures, as well as treatment before and after welding where this is necessary.

"Lukens Cromansil Steel" is the subject of a new bulletin describing a newly developed high-strength steel that is available in plate and sheet form. Physical properties are listed and compared with other structural steels, and information is given on fabricating, riveting, and welding by the arc and gas processes. Copies of the bulletin can be obtained from the Lukens Steel Co., Coatesville, Pa.

"Insto-gas Appliances and Service" is the subject of a bulletin issued by the Industrial Propane Equipment Corp., Detroit, Mich. Insto-gas is made from propane and furnished in small, portable containers, and is recommended for melting lead, babbitt, etc., and for brazing, soldering, tempering and annealing. High heat and safe and easy operation are claimed.

"The Design of Jigs and Fixtures" is the title of a new pamphlet published by The Linde Air Products Co., 30 East 42nd St., New York, N. Y. A discussion is also given of the advantages of jigs and fixtures, from the standpoints of convenience, economy, and accuracy. Applications of such tools are also considered.

Harry Buegeleisen, 287 Fulton St., Brooklyn, N. Y., manufacturer of welding goggles and lenses, has just issued a 12-page catalog describing his entire line of eye-protection equipment, some of which are listed here for the first time.

"Burning Through Metal Barriers Under Water" is the title of a leaflet issued by the Under-Water Metal Cutting Corp., 17 Battery Place, New York, N. Y., telling the fascinating story of cutting and salvaging under water by means of the oxy-electric torch. This is a reprint of a magazine article.

A "Metalspray" gun containing new features of design is described in Bulletin 500, issued by the Metal Spray Co., 113 Llewellyn St., Los Angeles, Calif. The bulletin describes the improved details of construction, tabulates the spraying capacities, and illustrates several applications of the gun.

"Rego" welding and cutting equipment is listed in Catalog No. 66, a 40-page booklet recently issued by The Bastian-Blessing Co., 240 E. Ontario St., Chicago, Ill. The effect of torch design and operation on efficiency is discussed.

The "Wileo" alternating-current welder is described in a folder issued by the Wileo Electric Welding Machine Co., 446 State Ave., Kansas City, Kan., which features the economy and simplicity of alternating-current welding.

"The Importance of Proper Selection of a Protective Welding Lens" is the title of a leaflet issued by The Lincoln Electric Co., Cleveland, Ohio, giving test results on Super-Visibility Lens.

Commercial News

Lincoln Appoints Manager on Pacific Coast

Closely identified with the welding industry for the last seven years, Seth H. Taylor, Jr., has been appointed Pacific Coast manager for The Lincoln Electric Co., Cleveland, Ohio, with headquarters at San Francisco. For the last four years Mr. Taylor was in charge of the Los Angeles office of the company, and previous to that he was engaged in research and applications of production welding at the main plant in Cleveland.

Since his graduation from Western University, Mr. Taylor has been constantly active in one branch or another of the arc-welding industry. He has the distinction of being partly responsible for one of the first arc-welded office buildings ever to be erected. He was engaged for a time in the job welding business, and worked for several large companies in the study of automatic arc welding.

Disposes of Patents on Electrode Coatings

Patents covering electrode coatings and methods of applying coatings have been purchased by E. D. Bransome, of Rumson, N. J., from the Electric Arc Cutting & Welding Co., of Newark, N. J., and from C. J. Holslag, of the same address. It is reported that licenses under these patents will shortly be granted to the J. D. Adams Manufacturing Co., American Chain Co., American Steel & Wire Co., Bethlehem Steel Co., Indiana Steel & Wire Co., Keystone Steel & Wire Co., The Lincoln Electric Co., Pittsburgh Steel Co., Una Welding, Inc., and Wilson Welder & Metal Co., Inc.

The Welding Equipment & Supply Co., 3524 East 74th St., Cleveland, Ohio, was recently organized for the distribution of welding equipment and supplies. This company is direct factory representatives for the following concerns: The Harris Calorific Co., Pratt-Brayman Co., Universal Power Corp., The American Brass Co., and Shawinigan Products Corp. Otto Fathauer and Ed. Leypoldt, of the new company, are widely known to the industrials and railways of northern Ohio.

L. S. Hamaker, sales promotion manager of the Republic Steel Corp., Youngstown, Ohio, has been advanced to the position of vice-president and general manager of The Berger Manufacturing Co., Canton, Ohio, with which concern Mr. Hamaker one time served in the sales department and later became advertising manager. The Canton company is a wholly owned subsidiary of the Republic Steel Corp.

R. S. Archer has joined the staff of the Republic Steel Corp. as chief metallurgist of the Chicago district. Mr. Archer was formerly Director of Metallurgy of the A. O. Smith Corp., Milwaukee, and prior to that was in charge of the Cleveland Section of the Aluminum Research Laboratories of the Aluminum Co. of America.

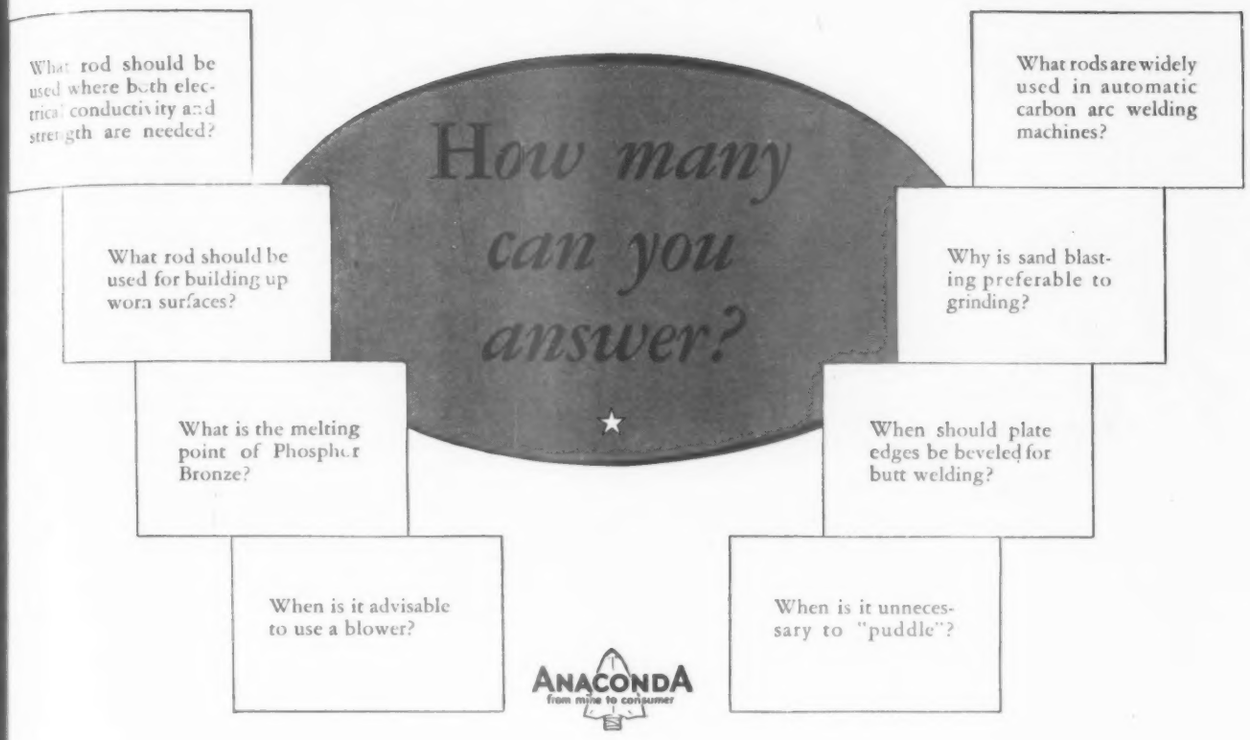
The Bingrod Co., Cassopolis, Mich., recently appointed the following distributors of their products: Michigan Gases, Inc., Grand Rapids, Mich.; The Mossman Yarnelle Co., Fort Wayne, Ind.; Bryan Automotive Parts Co., Bryan, Ohio, and C. A. Schrader Co., South Bend, Ind.

Fred C. Cool, of Seattle, Wash., has been appointed wholesale distributor for California, Washington, Oregon, Idaho, and Wyoming for "Aladdin" products, according to an announcement by R. A. Ogden, manager of Aladdin Rod & Manufacturing Co., Des Moines, Iowa.

An increased production on light-gage 18-8 stainless-steel pipe fittings has been reported by R. E. Fritsch, vice-president, Tube-Turns, Inc., Louisville, Ky., who also states that there is a very noticeable increase in inquiries and orders for fittings in the non-ferrous alloys.

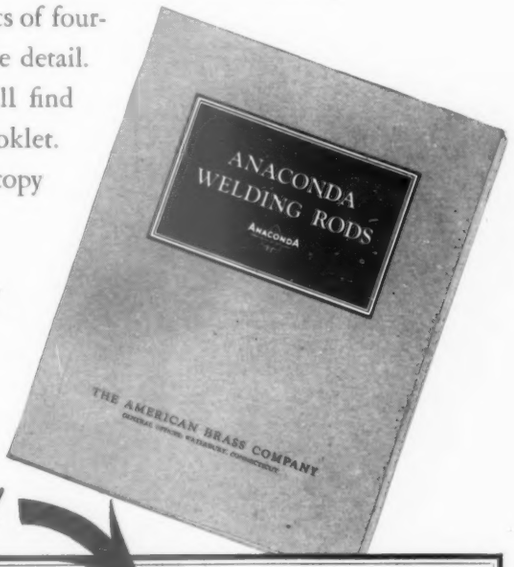
Wm. Lex, of the Wm. G. Lex Co., Evansville, Ind., recently met an untimely death. The business of the company, which Mr. Lex developed, will be continued, it is announced. This company is distributor for products of the Air Reduction Sales Co.

Resistoloy, of Grand Rapids, Mich., manufacturers of hard-facing alloys, announce the appointment of the following distributors: P. C. Hazeltine, Portland, Ore.; The Hub Co., Madison, Wis., and C. H. Dockson, Detroit, Mich.


What rod should be used where both electrical conductivity and strength are needed?
What rods are widely used in automatic carbon arc welding machines?
How many can you answer?
What rod should be used for building up worn surfaces?
Why is sand blasting preferable to grinding?
What is the melting point of Phosphor Bronze?
When should plate edges be beveled for butt welding?
When is it advisable to use a blower?
When is it unnecessary to "puddle"?
ANACONDA
from mine to consumer

THESE and hundreds of other questions about welding and welding rods are answered in our new, 16-page booklet, "Anaconda Welding Rods". In fact just about everything you could want to know about bronze welding is described and illustrated. Suggestions on preparation for welding are given. Procedures to be followed with different methods of welding are described. And the welding properties, melting points, and individual characteristics of fourteen different copper-alloy rods are given in complete detail.

Every foreman, every welder and every helper will find much of interest in this new and informative booklet. If you will fill in and mail the coupon below, a copy will be mailed.



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Work has started on the North Park bridge, a short distance out of Grand Rapids, Mich. This is a 5-span structure, 562 ft. long, and will require 7000 lineal feet of welding. The Service Welding Co., Saginaw, Mich., who is doing the work, states that about six weeks will be required to finish the job.

The Corpus Christi (Texas) Refining Co. plans the early construction of an oil refinery in that city. The site of this plant is near a $10,000,000 chemical plant now under construction by the Southern Alkali Corp. These combined projects will employ a vast amount of welding.

A 10-in. high-pressure welded gas line, 50 miles in length, is planned for the Paramount Gasoline Co., of Freeport, Texas. The line will extend from the Paramount Co.'s gas wells at Pledger Dome, 25 miles from Freeport, to Houston.

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Help Wanted—75c per line, minimum 4 lines. Jobs Wanted—4 lines free. Other Ads—$1.00 per line, minimum 4 lines Count 8 words to line. Add 6 words for keyed address.

FOR SALE

For Sale—175-Ampere Welding Generator, accessories all new. Guaranteed. Price $95.00. Prestoweld Welding and Cutting Outfit, almost new. Price $45.00. Going out of business. Neil S. Miller, 528 Camp St., Harrisburg, Pa.

For Sale—Two-man welding shop fully equipped for acetylene and electric welding. Doing excellent business. A-1 location in eastern central Ohio. Reason for selling: leaving town. Address MR-3, The Welding Engineer.

Bargains—Demonstrator Arc Welders. Gasoline, electric drive, belted, or coupled-together outfits. 30 days' trial. Easy terms, if desired. Write Ken's Welding Exchange, Box U-641, Troy, Ohio.

For Sale—300-lb. Davis-Bournonville Acetylene Generator, in good condition, for sale cheap. Aramingo Welding Co., Inc., 1130 N. Delaware Ave., Philadelphia, Pa.

BUSINESS OPPORTUNITY

Want large distributors or one national distributor for 5-piece non-backfiring torch to sell at $10. Patented. Has 8 tips. Well built. Low or high pressure. Big discount. Torch Supply Shop, 1637 E. Vernon Ave., Los Angeles, Calif.

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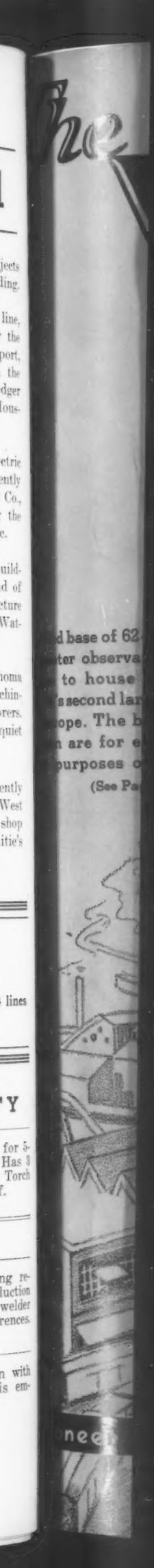
Combination Welder—16 years' experience, including refrigeration piping, stainless steel, bronze, factory production work, and architectural aluminum work. Will work as welder or take charge of shop. Will go anywhere. References. E. A. Johnson, 1024 N. Lawler Ave., Chicago, Ill.

Arc Welder—14 years' experience. Desires position with industrial firm, preferably where only one welder is employed. Steady. Howard B. Furman, Matamoras, Pa.



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